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The Journal *of* Orthopædic Surgery

ARTHROPLASTY.

DR. V. PUTTI, BOLOGNA, ITALY.

I TRUST that the President and members of this Congress to which I have had the great honor of being invited, will not accuse me of presumption if I dare to speak about the *surgical treatment of ankylosis* in the country which has given birth to Rhea Barton, the first who attempted an arthroplasty, nearly a century ago, and in the land of J. B. Murphy, of Baer, of Osgood, and of many other orthopaedic surgeons who were the pioneers in these researches which led to one of the greatest conquests of modern surgery.

I have been induced to make this choice, not because I presume to have anything new or interesting to say on the subject, but above all to render an act of sincere homage to American surgery and specially to its great master, the late J. B. Murphy, to whom we owe the immense progress made in the field of arthroplasty. Whoever at present wishes to discuss this subject cannot say more or better than J. B. Murphy has already said.

If I have decided to lay before you the fruit of my experience, I do so because I am quite convinced that it is the duty of those who have dedicated themselves with special activity to this subject to divulge the ideas and methods which have had for their first originator J. B. Murphy.

I need not insist on the utility of this propaganda before such a competent audience. In comparison with the scanty number of the convinced, there is still a numerous category of surgeons who, notwithstanding the innumerable proofs of the practical value of the

mobilization of ankylosis, discuss the indications and are skeptical before the most brilliant results.

This history of medicine shows us how difficult and slow is the divulgation of new ideas and methods.

But considering the injury that even a short delay in the generalization of arthroplasty may cause to a great number of patients, it is our duty to do our best so that every uncertainty and opposition may be quickly and definitely overcome.

Therefore it seems to me that even a modest contribution of facts well observed and sincerely set forth may attract the attention of those who have not yet attempted these methods. It is with this hope that I try to report to you the fruit of my experience.

My first arthroplasty dates from ten years ago. From that time to the present day I have performed 113 mobilizations of ankylosis, of which 10 were of the jaw, 1 of the shoulder, 38 of the elbow, 1 of the wrist, 2 of the fingers, 17 of the hip, 40 of the knee, 2 of the ankle-joint, 2 of the toes.

INDICATIONS AND COUNTERINDICATIONS.

At the beginning of the discussion of arthroplasty the first argument which must be taken into consideration is that of the indications and counterindications as to the surgical treatment of ankylosis. Thanks to the satisfactory results obtained by arthroplasty in these late years, the limits of the indications have become enlarged. For some cases the indication is absolute, that is, for ankylosis of the temporo maxillary joint, for the bilateral ankylosis of the hip, for that in extension of the elbow, for that which affects at the same time many joints of the same limb. For the other ankyloses the indications depend on the examination of several elements.

1. The general health of the patient, his age, his mental condition, his social state. It is quite evident that arthroplasty is never an essentially necessary operation. It is therefore the surgeon's duty to explain to the patient the risk he runs, and to operate only when he has the greatest certainty of success, and when he is sure that none but surgical means can cure the ankylosis. The patients who are not in perfect condition of organic resistance are not adapted to support an operation, which is always long, and to bear a postoperative treatment which may last for months.

As to the age, I have noticed that arthroplasty is not suitable for children and old people. The best age is from 20 to 50. It is easier

to be successful on a man of 55 than on a boy of 15. The reconstruction of a joint is so complex a phenomenon of biologic adaptation that it can attain success only when the work of a clever surgeon and the active coöperation of a willing and intelligent patient act together. We must therefore be prudent in proposing arthroplasty to a patient if we cannot thoroughly rely on his firmness of will to endure calmly the inevitable suffering, and on his tenacious perseverance in the post-operative treatment. Men, therefore, in this respect, are more adapted than women and children or subjects who are intolerant and irritable, and the mentally deficient are not less adapted than those who for secondary ends are not willing to be cured.

Also the financial state of the patient must be considered. If the technical progress achieved of late allows us to attain the result more rapidly, it is true that after the operation the patient must remain under the surgeon's care in the hospital for a long time. The after treatment of an elbow arthroplasty requires not less than six weeks, that of knee arthroplasty not less than twelve weeks. If the patient cannot financially afford this period of after treatment, we should not advise the operation. The arthroplasty must depend, too, upon the patient's occupation.

2. The etiology, the pathogenesis, the anatomical conditions, the duration of the ankylosis.

The post-traumatic arthritides are the best adapted to arthroplasty. When every orthopædic and physiotherapeutic means has been tried without success, and when the patient will not tolerate the deformity, the surgeons must propose the operation with faith in its good effect.

But we must not proceed too quickly. It is essential that the joint should be neither painful nor swollen. Experience shows that the treatment is much more successful in the bony than in the fibrous and painful ankylosis.

In the ankylosis after infectious arthritis the problem of the indication is much more delicate. It is necessary to distinguish the ankylosis from acute arthritis both primary and secondary, from that due to chronic processes, both mon-and polyarticular. The arthroplasty is much more likely to succeed in the former than in the latter. The reason is that the acute arthritis has a well defined course, whilst in some cases of chronic arthritis it is very difficult to judge when the infection is over. Now the arthroplasty should not be performed until we are quite sure that no trace of the primary disease exists. I consider it a fundamental principle of arthroplasty to postpone the opera-

tion for not less than a year from the time when all sensitiveness of the joint has disappeared.

We can judge precisely of the recovery of a gonorrheal arthritis, but when can we say we are sure not to awaken a latent infection in a tubercular joint? Notwithstanding the good results obtained by Baer and, in some cases, also by Murphy, I have operated upon only one case of tubercular ankylosis, an elbow, out of more than a hundred arthroplasties. I think that for the present ankylosis must be considered as the best result of a tubercular arthritis.

For analogous reasons the ankylosis due to progressive arthritis and that affecting many joints do not lend themselves to arthroplasty. Out of four cases of arthroplasty for bilateral ankylosis of the hip, after Marie-Strümpell disease, I succeeded in only one, and in another the result was moderately satisfactory. In the other two I had no success at all.

The ankylosis after war injuries must be considered apart. In these cases, we must distinguish the ankylosis after a direct injury to the joint from that due to a prolonged immobilization of the limb. These latter, of which the most frequent example is the ankylosis of the knee after an exposed fracture of the femur, are quite adapted to arthroplasty. In the former, if the wound is aseptic, we are in the same condition as in the common traumatic ankylosis. But this does not often occur. Much more frequently the ankylosis is the result of an infected wound, and therefore the indication as to an arthroplasty must be examined more attentively. The arthroplasty must not be proposed or performed unless we are perfectly sure that the infection is over, and we all know how difficult it is to judge of the complete sterility of the tissues infected by a war injury. The wounds must be completely healed, the fistula closed, not a sign of swelling, tenderness or pain must remain. The x-ray must assure us that sequestra or foreign bodies are not present. The ankylosis subjected to massage, hot air treatment and gymnastics, must not give any sign of reaction. We must not be in haste to operate; we must wait for months, and sometimes for years.

I have had excellent results in war ankylosis, but the few unsuccessful cases and the only case of death were due to a too precocious intervention.

It is generally thought that a too prolonged delay may be injurious to the functional condition of the muscles. That is true, but only to a certain degree. Clinical experience has shown us that muscles which

have remained for many years inactive can rapidly re-assume their normal function to a great extent.

In a case of ankylosis of the temporomaxillary joint dating back 15 years, I have noticed that the muscles have regained their function a few hours after the operation. From a certain point of view, an old bony ankylosis in which the muscles are atrophied is always preferable to a fibrous one in which the muscles are in good functional condition. In short, the aforesaid are the general indications of arthroplasty.

Now a few words about the special indications for each joint. It would be as much as to say that we did not recognize the great suc cess of arthroplasty, if we denied that the field of action in this respect has been greatly enlarged. As I have already said, the indication must be considered as absolute for certain cases of ankylosis, that is to say, that of the jaw, the bilateral of the hip, and those in extension of the elbow. But who can deny nowadays that all the cases of ankylosis of the elbow, with due exception for their nature are adapted to mobilization? You know it is many years since Ollier stated that even the right-angular ankylosis must be operated upon.

I have seldom met with the necessity of operating upon an ankylosis of the shoulder, considering how easily the lack of movement of this joint can be compensated for by the articulations near it.

The ankylosis of the wrist must only be operated upon when the hand is rigid in palmar flexion. The arthroplasty of the fingers may be successful in some cases. The arthroplasty of the unilateral ankylosis of the hip, which fixed the joint in a position of deformity, may be proposed in every case in which the patient cannot accustom himself to the deformity or when there are reasons for not prefering the subtrochanteric osteotomy. In the bilateral ankylosis I think it is better to operate on one side only, although in four of my cases, I have operated on both sides, because the patients, satisfied with the first arthroplasty, requested a second operation.

Coming to the knee joint, I wish to explain my point of view quite clearly.

It has been considered for a long time that a bony ankylosis in a good functional position is not seriously harmful to the patient. This way of thinking agrees with the idea that a bony fixed ankylosis is always preferable to a painful, slightly movable, unsteady pseudo-arthrosis. Now that the experience of many cases has shown the possibility of creating new joints which possess excellent functional qualities, which can support any work, and which, even after many years do not lose their power, I think that also the knee arthroplasty ought

to be accepted with greater faith and should be executed more frequently. But at the same time that I make this statement, I feel it necessary to add that knee arthroplasty should be advised only when a precise indication is recognized, and it must be executed by operators who have acquired a notable skill in the reconstruction surgery of the joints.

I have operated upon only two cases of ankylosis of the ankle joint and two of the metatarso-phalangeal joint of the big toe.

TREATMENT.

The operative treatment can be summarized under the following general rules:

1. The incision should be made in such a manner as to permit a complete exposure of the joint, without, however, injuring those parts which preside over its mobility and steadiness. As to the elbow, I have used in the great majority of cases Kocher's incision; for the hip a curved transtrochanteric incision tracing a flap with proximal base; for the knee a U shaped incision with the base downward, which surrounds the patella. For the shoulder and wrist I employ a straight incision; for the ankle joint two lateral ones.

2. In the resection, it is necessary to give to the epiphysis a shape appropriate to its function, taking off, however, enough bone to create a wide interarticular space which permits an ample movement without pressure. Between the surfaces there must be a distance of not less than an inch.

To perform the arthrolysis I make use of special curved chisels of different shapes. To smooth and model the articular surfaces I make great use of files. For the hip, I employ Murphy instruments, worked by motor.

When the epiphyses are prepared, it is necessary to remove carefully the scarred tissue in which the capsule is generally degenerated.

3. It is not necessary to insist on the utility of covering the epiphysis with a substance destined to avoid the contact between the bone surfaces. I think we may affirm with certainty that the great progress made in the field of arthroplasty must be exclusively ascribed to the interposition method. We are always free to discuss the manner of action of these substances and the utility of using one rather than the other. The results of the experiments made to clear up these questions are very discordant. While Allison's and Brook's interesting researches would seem to prove the uselessness of the interposi-

tion, the studies of Sumite, those of Neff and of Baer, and my own, prove that the substances employed greatly facilitate the formation of the neoarthrosis.

In my opinion, these substances serve: (a) to allow the sliding of the articular surfaces to take place easily, immediately and painlessly, so as to permit an early mobilization of the neoarthrosis; (b) to form a barrier to the bony formation from the epiphyseal surfaces; (c) to constitute the first trace of the articular cartilage and the first outlines of the synovial membrane, thus facilitating the formation of those mucous bursae and hygromata to which J. B. Murphy was the first to attach so much importance. I have no experience about Baer's and Cargile's membrane. I think it is not worth while to use pedunculated flaps. I have always used free aponeurotic flaps taken from the fascia lata, with which I cover the two epiphyses completely and which I fix in place with a few catgut stitches.

4. The reconstruction of the joint must be carried out according to anatomical principles and with the greatest accuracy. The stability of the new joint greatly depends upon the way in which the reconstruction has been performed. I have never used drainage.

POSTOPERATIVE TREATMENT.

The newly operated joint is immobilized in a plaster of Paris splint. in a semiflexed position. A traction is applied to the distal fragment so as to keep the surfaces distant from each other. I attach great importance to this traction which I leave in place for nearly a month, especially in the arthroplasty of the lower limb. The first movements must not begin before the tenth day, and they should be passive, executed by the patient himself by means of very simple apparatus applied to the bed. To avoid pain or fatigue to the joint, I think it indispensable that the patient should regulate the treatment himself, and not the doctor, who, at the beginning, has only the supervision of the patient.

As soon as the wounds are closed, the hot air treatment begins; in the first days it is done by means of an electric, afterwards with an alcohol, apparatus.

The hot air treatment must continue for many months. I do not attach much importance to massage in the beginning, while I consider it useful to stimulate the most important muscles by means of electricity. It is not necessary to begin the mechanical treatment before

the twentieth day. For the elbow and knee I find Bennett's old and simple apparatus very useful.

In the arthroplasty of the lower limbs, the patient does not take his first steps before the thirtieth day.

It is not worth while explaining further in regard to the postoperative treatment, because it is not possible to fix general rules. I only wish to point out that in the postoperative course of every arthroplasty there is a period which I should call *critical*, which sets in about a month after the operation, when the joint becomes somewhat painful and stiff. It is possible that during this period both the patient and surgeon have their doubts about the possibility of obtaining a good result. But in reality there is no need for anxiety. The critical period is the usual consequence of the drying up process of the joint and sometimes also, of exaggerated exercise. The hot air treatment must be suspended for some days; after this the movements may be carefully and gradually resumed. For two joints in particular, the postoperative treatment must be prolonged, namely, the temporomaxillary and the knee.

PROGNOSIS AND RESULTS.

The prognosis and results of the arthroplasty can only be judged after the lapse of a few years. Not taking into consideration the single isolated contributions which are becoming more and more numerous, there are now some very important collections of statistics, each of which consists of more than a hundred cases, which permit us to draw concrete conclusions as to the possibilities of this method of treatment and about the results to be expected from it.

Considering comprehensively the data supplied by these statistics and taking into account the opinions expressed by the most experienced surgeons, we may conclude that the prognosis of arthroplasty is improving at the same rate as the perfecting of the surgical technique and the establishing of more precise criteria on the choice of cases.

I was, myself, very reserved in my conclusions in the report I read at the International Congress of Medicine in 1913 and in that which I read before the French Society of Surgery in the same year, but now I feel that I can assert conscientiously that arthroplasty is an interference worthy of the greatest faith and destined to assure a real, functional advantage to the patient. It is obvious that a clinical experience of more than a hundred cases, extending over a period of about ten years preceded by a numerous series of experiments, permits

me to be now more decided in my statements and firmer in my convictions.

At the same time, however, I feel it my duty to add that arthroplasty is not a treatment to be lightly proposed or undertaken. It requires a vast experience in the choice of cases, a notable mastery of surgical technique, a complete knowledge of physiotherapeutic methods. It is, therefore, an orthopædic treatment in the strictest sense of the word, and it is to be hoped, for a bettering of the results, that the orthopædic surgeons will in the future make a greater use of these operations which until now have been almost entirely in the hands of general surgeons.

In judging the results of arthroplasty we must now be more exacting than we were before. The result must not be called good only in regard to the amount of movement obtained. The new articulation must possess in a just measure all the properties which render the normal joint useful, that is to say, besides the amount of movement, a good stability, a fair resistance to hard work, and painlessness. A knee which possesses only 45 degrees of movement, but is firm, strong and painless, is frequently more useful than one which can bend to the right angle, but which cannot bear the weight of the body. The same may be said of the hip.

But this is not enough. To judge of the real functional value of a new joint, it is necessary to know how it acts under the work it has to perform, because our task is not to create an articulation which only conforms to esthetical requirements, but a neoarthrosis, healthy, active, strong, capable of supporting for years the efforts and fatigue of a normal joint, and one that will be useful to the patient, whatever his profession or trade may be.

But these elements of criticism can only be collected from statistics formed from a great number of cases and concerning also patients operated upon a long time ago. I have estimated my results according to the aforesaid criteria and I have come to the following conclusions:

1. The modern methods of arthroplasty allow us to create articulations that can attain functional properties which in some cases are equal to those belonging to the normal joints; in others, the new joint can fully satisfy the most exacting wishes of the patient.

2. These articulations are able to support for many years even the work of trades which are very fatiguing. Some of my patients operated on for arthroplasty of knee and elbow have been declared capable of military service and have taken part in the war.

3. In the ankylosis of the lower limb it is possible to obtain articulations which are not only quite movable but also steady, painless and able to support the greatest fatigue. My personal experience has shown me that the knee-joint, which until a short time ago was considered at the least adapted to arthroplasty is, on the contrary, the one which can give the greatest satisfaction both to the patient and surgeon.

4. I am quite convinced that the progress which has already been made, and that which will be made, in the field of arthroplasty, is essentially due to the interposition method. For my part, I prefer to use the free flaps of fascia lata.

5. My experiments and direct examination of the reoperated joint of three of my patients have proved to me that the mechanism of formation of the neoarthrosis, obtained through the interposition of a fascia flap, is the same which was foreseen and described by J. B. Murphy.

6. The secret of the success in arthroplasty lies in the right choice of the cases, in the technical precision of the operation, and in the accuracy of the postoperative treatment.

7. As to the prognosis of each joint, taking into account only those most frequently operated, my statistics, according to successful results, give the following scale: (1) elbow; (2) knee; (3) jaw; (4) hip.

Arthroplasty is not associated with great danger to life. Out of 113 patients, I have had two deaths.

ARTHROPLASTY OF THE KNEE—REPORT OF CASES.

BY WILLIS C. CAMPBELL, M.D., MEMPHIS, TENN.

MANY procedures have been devised to mobilize stiff joints, consisting of various materials being interposed, such as metals, membranes, and even an entire joint has been transplanted, but as yet no definite

measure offers a high per cent. of success, except in the elbow, wrist, hip and temporo-maxillary joints, where stability is not essential and sufficient bone may be removed to insure motion. The knee joint is a different proposition and offers by far the most difficult problem, and unfortunately, is most frequently affected by acute infections with ensuing ankylosis.

In bringing this subject before you at this time, I have no method that offers a greater degree of success than has been attained. My results on the whole have not been satisfactory. Animal experiments are of little or no value, for we cannot produce the same conditions

EXHIBIT A.—Two years after arthroplasty for complete bony ankylosis, showing degree of extension.

found in an ankylosed human knee, nor can intelligent coöperation be secured, which is absolutely essential in the after treatment.

No attempt should be made to mobilize tubercular joints. Only those with ankylosis following acute infections are suitable for operation.

Pathological changes vary, depending on the nature and intensity of the infection and the resistance of the individual. Fibrous ankylosis occurs in a small proportion of cases, and may show: (1) a complete fibrous substitution with only perceptible motion; (2) irregular

scattered fibrous bands with intervening cartilage and fat; (3) irregular fibrous union with areas of destruction of the articular surfaces and hyperplastic bony outgrowths. In all types of fibrous ankylosis there may be slight motion, which is often painful. More frequently bony ankylosis occurs in which is found three distinct types: (1) complete destruction of the articular surface and adjacent bone for a short distance, with solid union of joint surfaces; (2) solid bony union of entire joint surfaces, with rearrangement of bone lamellae and canaliculization, forming a medulla which is continuous with the femur above and the tibia below, converting the two bones into one, from the hip to the ankle. This, of course, is only a phenomenon of functional adaptation and is seen in those of long duration; (3) complete bony union following infections of the shaft of the tibia and femur (osteomyelitis), with increase in bone density and loss of normal structure.

In all types of fibrous ankylosis arthroplasty may be advised, and in the first type of bony ankylosis, for only the joint surfaces are involved in the process, which may be removed, leaving healthy, spongy bone beneath. In the second type of bony ankylosis with medulla through joint, mechanically a new joint could not be reproduced, even should restoration of atrophic muscles be possible. In the third type, we cannot expect dense hypertrophic bone to form the base of a new articulation. Such material is low grade and bears the same relation to bone that scar tissue does to soft tissues.

Ankylosis may exist between the tibia and femur with patella free, or between the patella and femur with a normal tibio-femoral articulation or all parts may be united by solid bone with no line of cleavage.

Age is obviously a contra-indication. Only young adults should be considered. The procedure is advisable when malposition exists, as correction of deformity will justify the means if no motion is obtained.

The operation (for which no originality is claimed) is as follows: The common U incision is made through the skin, the outer end may be continued upward along the lateral aspect of the thigh. If the knee is extended, the quadriceps tendon will usually not allow flexion, and must be lengthened. For years I have used the usual Z. plastic method as in contractures of the Achilles, more recently the technique of Bennett has been employed. If the knee is flexed the usual incision is made through the patella tendon or this structure may be elongated. From half to an inch of bone is removed from the femur or until normal relations can be secured. The intercondylar notch is obliterated, the lower end of the femur is made to conform to the convexity of

one normal condyle. After removing the upper extremity of the tibia to spongy bone, a concave surface is made from before backward. A shoemaker's rasp is next applied to all parts to make the surface as uniform as possible. As much of the patella is removed as is consistent with tensile strength. Pedunculated, free fascia, or absorbable membrane is now interposed and the joint closed. Recently, in addition, the prepatellar bursa has been interposed by dissecting from the anterior aspect passing beneath and attaching to the opposite side. Joint line must be accurate, otherwise there will be lateral displacement. At the completion there should be considerable laxity, with hyperextension possible to forty or fifty degrees.

In those cases with bony union of the patella and femur and apparently normal knee-joint, the prepatellar bursa is employed, and the knee placed in flexion, so that the posterior surface of the patella has, in addition to the interposed bursa, the articular cartilage. The limb is placed in cast, and in some cases the Thomas splint, but no motion until the wound is healed, which requires from three to six weeks. Brisement forcé has been of no more value than any other type of stiff joint; in fact, the best results have been obtained where not employed.

Twenty-four (24) cases form the basis of this report—in ten the fascial flap transplant was used. In one, forty degrees of motion was obtained; in two, thirty degrees of motion; in one, sufficient time has not elapsed to make final report. In the remaining six, ankylosis recurred. In nine, Baer's chromicized pig bladder was interposed. In four, the membrane, apparently of inferior quality, was extruded. In one, practically perfect motion resulted; the knee could be flexed to an acute angle with full, strong extension and no instability. In one, seventy degrees free motion; two were sequelae of osteomyelitis, with dense, low grade bone, and success could not be expected with any form of treatment. In two, free fascia lata was transplanted from the opposite thigh; both absolute failures, one infected. In three, in which the prepatellar bursa was employed, one has fifteen degrees flexion with voluntary extension, one has twenty degrees flexion with voluntary extension, one too recent to report progress. In not one of these cases can the final report be considered.

Sufficient time (one to two years) has elapsed in twenty. In four of these, faulty material (Baer's membrane of one lot) caused failure, three were in dense, low grade bone following osteomyelitis, making seven which should not be recorded as failures for reasons above stated, consequently we should only consider thirteen, nine of which obtained definite voluntary motion, in four not sufficient to be of ma-

terial value, but encouraging from the standpoint of experimental physiology. In five, satisfactory motion.

Bony ankylosis existed in twenty-four, eight in extension and sixteen with malposition. All obtained useful members in extension or slight flexion, except those which were so fortunate as to acquire active motion. In those in which ankylosis occurred, there was never active flexion and extension, but a gradual decrease in passive motion until no movement existed. In not one case with definite active motion to an appreciable arc did ankylosis recur. In all successful cases, or in those in which free motion was obtained, action of the quadriceps was in evidence at the end of six or eight weeks.

The action of interposed fascia is doubtful. More attention should be given to reconstructing a perfect mechanical joint and less to material interposed. I once had the opportunity of doing a second arthroplasty on a joint in which I had previously interposed fascia; we found ample space between the bones, but filled with dense scar tissue and the joint not movable.

In reviewing early cases, I am sure that inexperienced carpentry was a cause of failure, also the fear of producing an unstable member, and the removal of too little bone. The amount that can safely be removed has not yet been determined, but workers in this field have practically no precedent, and only by experience, which has often been disappointing, can success be obtained.

Such a report as the above is far from attractive, but at the same time, it is only by a study of such groups that we may ever approach a standard procedure which will give a high percentage of success in well selected cases.

DISCUSSION OF PAPERS BY DR. PUTTI AND DR. CAMPBELL.

DR. PRINCE, Rochester, N. Y.: My attitude toward arthroplasty has been one of "watchful waiting." I feel that the problems of arthroplasty can be solved by relatively few men who are much interested in it and who have the facilities for doing enough cases to test out their ideas.

I believe that the pathological indications for arthroplasty are pretty well determined and that the time has come when some general application of this procedure can safely be begun. I believe that as soon as one feels that he

has the requisite technique and skill to carry out the procedure, he should then determine whether the patient has the moral right to have a movable joint. By that I mean courage; if he cannot endure suffering after the operation, the result will not be good. This, to my mind, is the most important requirement.

I think we have all had successes with jaw cases. The only hip case I have tried was a failure because the patient lacked the courage to get a good result.

I think we are all surprised at Putti's feeling that the knee joint offers so good a prognosis; certainly the results shown by Dr. Putti were better than anything I have seen before, anywhere. I believe it is largely due to his method of approach. I very much fear that the general application of this operation is going to be followed by many bitter disappointments; this is going to be because of a neglect of the indications, so well pointed out by readers, and the over-estimation of the skill and technique of the operator.

DR. WALTER TRUSLOW, Brooklyn, N. Y.: I feel like reporting three cases of arthroplasty. In one case, I do not know the end-results. The patient was a child, who came to me with a congenital fusion between the humerus and the radius. Very curiously, when operated on, I found there was free motion between the ulna and humerus. Why it existed in a girl going on to fourteen years, I could not tell. I freed the radius from the humerus, and found that between the ulna and radius there was free motion. I put in the prepared pig's bladder and never saw the end-results. The child's mother was angry because I did not attempt to treat the webbed fingers first.

The other cases were of tubercular hip, each hip having thirty degrees of flexion. The operation was performed three years after the active symptoms had subsided. Instead of Gant's operation to improve the deformity, there was fascia lata interposed, after freeing the joint. The end-result in each case was excellent.

DR. EDWIN W. RYERSON, Chicago: I have done more than fifty arthroplasties on various joints, and it seems to me that it is a standard procedure at the present time in certain joints and that it should really be used in other joints. I have done ten or eleven knee joints, and only one was good enough for me to be at all ambitious to show it to any surgeons. The others, with one exception, were failures, and the exception has only twenty-five degrees of motion. The hip and elbow joints are the two that I have had most experience in. I have done about thirty elbows, and the majority have been very satisfactory. In the hip, I have done what I think should not be done. I have tried to carve out the head of the femur, leaving it as anatomically perfect as possible. It is not necessary to have a perfect head. I have frequently not cut out enough bone. It is remarkable to see how comfortably people get along with only a little neck sticking into the acetabulum. The most successful cases often resemble an excision of the head, with the neck forming the weight-bearing support. We should take out more bone, and should use traction afterwards. At one time, Dr. Baer advised putting the joints up in plaster casts and immobilizing them for a month or more. I did this in a dozen cases, and the result was unsatisfactory. I have used Baer's chromicized pig's bladder in the majority of cases. Though once in a while we get a bad case, most of them are satisfactory. By hardening Cargile membrane in alcohol for two weeks, it does as well as the Baer membrane, and is less irritating. By using two thicknesses, one gets a tough, transparent and pliable material which does the work as well as anything I know of. Allison's silverized fascia has not been quite so satisfactory.

DR. FRED H. ALBEE, New York City: I cannot refrain from saying a word about Prof. Putti's work. I had the good fortune to visit his wonderful clinic and operate there two years ago. At that time, I also saw him do an arthroplasty of the knee, and saw several of his results. They certainly were far beyond anything that I have seen elsewhere.

In regard to the question of application and efficiency of arthroplasty, in this connection, I should like to emphasize the importance of taking up the consideration of some form of this operation for the relief of that large group of congenital dislocations of the hip that will not stay in place after bloodless or open reduction or where the femoral head cannot be got into the socket at all. The type of operation where the acetabulum is deepened by increasing its rim with bone grafts or building a new acetabulum by similar methods higher up on the ilium offers a great deal for these otherwise unfortunate cases. (See Albee's Orthopedic Surgery.) It is not so important if the acetabulum is a little above where the normal one should be, providing the hip joint is stabilized.

DR. OSGOOD: I find that I owe Dr. Starr an apology. He was down to discuss Dr. Putti's paper. I am sure you will be disappointed if you do not hear what Dr. Starr has to say.

DR. CLARENCE L. STARR, Toronto: I am sorry that you discovered the error. I was having a good time. I want to say that I enjoyed beyond measure the presentation of Professor Putti. He almost converted me. When I came here I had a feeling, fairly fixed, that the knee joint gave such good functional results after ankylosis in a good position, that it was proper to leave it alone. I came here with the intention of saying so; but after the presentation of Dr. Putti, I am not sure but that I should be willing to try it again. What we have experienced is a very distinct advance in surgery, and does great credit to him; and I think it will be an incentive to redouble our efforts.

May I emphasize what has been noted by Dr. Putti, that is. I am sure that fifteen minutes of his paper was taken up by the caution he gave as to the types of cases to be selected. I am sure you will bear with me if I bear testimony to the necessity for this caution in selecting the types of cases, and bearing in mind the indications that Professor Putti has so well put before us. Many cases will stand a lot of letting alone. I am quite convinced of it, and I am sure that Professor Putti is. There are certain groups of cases in which it might be of definite advantage to perform such an operation, and the technique presented seems to me the greatest advance so far. My feeling is that no part of our surgical work requires more judgment than to know when to immobilize a joint and when to leave it alone. Those who have had the same amount of experience that we have had, will be struck by the fact that many have not improved the limbs that were very serviceable before. I found quite a number of cases of good, serviceable elbows and shoulders especially, and some hips and knees, which, in the ordinary type of function, the board would pass as ten or fifteen per cent. disability, but which have been rendered 80 to 90 per cent., and sometimes total disability, by an enthusiastic surgeon. I have one case especially in mind, that of a laborer with an elbow in good position, who could do his work as well as before, but who was made a hopeless cripple by resection of the elbow to give him motion, which he has attained but which is painful. It is useless from his standpoint. If he had been an accountant, if might have been useful to him.

Now a word about technique, and then I am through: I have the greatest faith in the possibility of the future service of free fascial transplant. Some of my younger colleagues have been working on the question of the transplantation of tendons and the utilization of fascial grafts. I hope that Dr. Gallie will be able to present some of the work at a later session. He has demonstrated that it makes some difference whether you use a Baer membrane or an autogenous graft. It can be demonstrated that the membrane, after transplanting for some months, becomes re-vascularized and is retained as a living membrane. It makes a difference whether you have a permanent and living membrane, which will act as a future synovial membrane, or one which Dr. Baer admits will be absorbed in a certain time. Success depends on three factors: the separation of the ends of the bone; the remodeling of the bone ends to make a perfect joint; and the transplantation of the fascia lata in the double fashion.

I have to congratulate Dr. Putti on the magnificent presentation and the remarkable effect on the progress of orthopedic surgery.

REPORT OF COMMISSION ON STABILIZING OPERATIONS UPON THE FOOT.

PART I

BY ANSEL G. COOK, M.D., HARTFORD, CONN.

At a meeting of the American Orthopedic Association, held in Toronto, in June, 1920, a Commission was appointed to investigate the best method of obtaining stability of the foot in paralytic conditions by a study of end results of at least two years' duration; these results to be collected in several large clinics for the Commission and observed by them, looking to a standardization of surgical procedures and their indications.

Dr. Ansel G. Cook of Hartford, Conn., and Dr. Walter G. Stern of Cleveland, Ohio, members of this Commission, present for your consideration the following statement of their investigations and their conclusions.

Dr. Ralph R. Fitch of Rochester, N. Y., the third member of the Commission, was unable to attend all of the clinics, did not see the patients, and consequently does not join in this report.

Dr. Cook and Dr. Stern are in perfect agreement, but as no two observers see from exactly the same angle, it was considered best that each should tell what he saw in his own words. The first part of this report, therefore, which is general in character, is by Dr. Cook, while the second part, which is more technical and detailed, is by Dr. Stern.

The only direct result of poliomyelitis is a more or less complete paralysis of various groups of muscles; sometimes even all the muscles below the knee may be completely paralyzed. Bones, joints, ligaments, blood vessels and sensory nerves are not directly affected, and any changes that may subsequently appear in their structure must be regarded as secondary and, to a certain extent, preventable complications.

The disease, after the first short acute stage, is not progressive, and one attack protects against subsequent attacks.

It has been frequently asserted that the trophic nerve centers have been so disturbed as to inhibit the growth of the limb, but this has

never been conclusively proved. It is true that a paralyzed leg or foot is always smaller than the corresponding leg or foot on the opposite side that has not been affected, and that the circulation is not as vigorous in a paralyzed limb as in a limb that is not paralyzed. This lack of proper development and feeble circulation is, however, readily explained when we consider that the paralyzed limb has not been normally used and hence has not been normally developed.

The disability of the leg and foot are therefore due to: (1) Absence of muscle power, which in time leads to disturbance of muscle balance, distortion of the bones, faulty weight bearing, strain, trauma, and the pain accompanying trauma. (2) Lack of normal development from lack of normal use.

The objects of treatment should therefore be: (1) Rest and prevention of deformity for the first six months, or until such time as the actual amount of permanent paralysis has become apparent. (2) Use to encourage growth, the prevention of deformity; also the correction of any deformity that may have developed which may interfere with the proper use of the limb.

The subject is complicated, and can be studied in many different ways. The question naturally arises, what is a stabilizing operation? The Commission decided to make a beginning by selecting the simplest case possible, a flail foot, one in which all the muscles below the knee are completely paralyzed.

In order to obtain a preliminary consensus of opinion based on the personal experience of the members of the Association, a questionnaire was sent out, in substance as follows:

"The question to be answered is, 'What is the best method of obtaining stability of the foot in paralytic conditions?' " and you are asked to judge solely from the standpoint of function and from end results at least two years after operation.

It is obvious that paralytic feet vary greatly in degree, not only in regard to the amount of paralysis present, but also in regard to the amount of functional disability. Omit from consideration all feet that, in their present condition, are more serviceable than they would be after any stabilizing operation. Omit also from consideration all feet in which the functional disability is the result of faulty balance and in which the balance may be corrected by means of tenotomy, simple tendon transplantation, osteotomy or cuneiform tarsectomy. These operations, intended to correct faulty bone or muscle balance, are not, for the purpose of this report, considered as stabilizing operations.

Consider *only* a paralytic flail foot. The foot may be flaccid or it may be distorted in various ways. If the foot is distorted, it is

assumed that you will also do whatever may be necessary to correct the distortion at the time the stabilizing operation is performed.

A stabilizing operation, therefore, is only indicated when the loss of function of the foot depends upon the instability of the joint, or joints, and when, even after any faulty balance that may be present has been corrected, the muscles are still unable to control the movements of the joint.

In judging the value of any operation, it is manifestly unfair to consider: (1) Operations done on unsuitable cases. (2) Operations unskilfully performed. (3) Cases that have not received the proper after-treatment and have suffered from neglect. (4) All infections or secondary complications which, though they may have affected the final result, were not a part of the original operation or its necessary consequence.

An ideal flail foot is one in which, although all the muscles below the knee are completely paralyzed, the patient is still able to walk without artificial aid, without pain and without a limp. Such a foot or something nearly approaching it on which no operation has been performed, is occasionally observed.

In such a foot the bone balance must be perfect, so that the body weight falls evenly and without strain. The ligaments and tendons must be strong and contracted to such a degree as to allow only the desired amount of motion and to definitely limit this motion.

In walking, the weight of the body falls first on the heel, then on the arch, and finally on the ball of the foot. The tendons and ligaments, therefore, on the front of the foot and ankle must be sufficiently contracted to prevent toe drop, and the tendon of Achilles must be sufficiently contracted to absolutely prevent dorsal flexion of the foot beyond a right angle, else there can be no efficient leverage action when the whole body weight is borne on the ball of one foot as the opposite foot swings forward in the act of walking.

A heel walker, who bears little or no weight on the ball of the foot, will always limp, because the arc of the circle or rocker which the sole of the foot forms when in the act of walking over a flat surface, is shorter on the side on which only the heel is used. This is equivalent to moving the fulcrum of the lever from two to three inches backward, thus displacing the center of gravity, shortening the time in which the foot rests on the ground, and causing an inequality in the gait.

From an analysis of some seventy answers received to the questionnaire, it was learned that while three members of the Association pre-

ferred braces to any surgical operation, at least ninety-five per cent. of the remainder preferred astragalectomy or some form of arthrodesis.

Bone grafts, wires, metal plates, silk ligatures, and even living ligatures were considered unreliable or objectionable except for temporary use in certain cases or as supplementary and rendering more firm some special form of arthrodesis.

The question, therefore, lies between astragalectomy, as advocated by Dr. Royal Whitman of New York, and some form of arthrodesis. Or, if arthrodesis is preferred to astragalectomy, whether the method advocated by the late Dr. Gwilym G. Davis of Philadelphia, should be the method of choice. In contrasting astragalectomy and the ordinary operations intended to produce arthrodesis, it would seem to the Commission that there is no practical difference as far as the risk of life to the patient is concerned.

The Commission visited clinics prepared for them in the cities of Cleveland, Chicago, Milwaukee, Boston, New York, and Philadelphia, witnessed operations, and personally examined the feet of some two hundred and fifty patients.

These were not selected cases, but were taken at random and represented a fair cross section of the work. No effort was made to influence the decision of the Commission. There were the patients, there were the records of the hospital: we could make our own examinations and draw our own conclusions.

Dr. Davis devised two operations:

First, Subastragalar Arthrodesis, in which the joint between the os calcis and the astragalus, and the joint between the astragalus and the scaphoid, is obliterated. This is done almost subcutaneously by means of a small gouge through two openings, one on the inner and one on the outer side of the foot. The foot is then moulded into the desired position, and when ankylosis takes place, if the foot is otherwise normal (and there is no lateral motion in the ankle joint), lateral motion is prevented. No bone or cartilage is removed from the wound.

This method should be contrasted with that of Dr. Edwin W. Ryerson's Triple Arthrodesis. Dr. Ryerson, through an open incision, removes the cartilage from the joint between the os calcis and the astragalus, the joint between the astragalus and the scaphoid and the joint between the os calcis and the cuboid. He also advises cutting the flexor tendons of the toes.

Both of these operations appeared to give the desired results and

not a sufficient number of cases were presented for the Commission to determine which was the operation of choice.

Dr. Davis' second operation—Transverse Horizontal Section—consists of a subastragalar arthrodesis plus a very free subcutaneous dissection of the soft structures about the ankle joint from the external and internal malleoli, and from the bones of the foot whereby the foot may be displaced backwards, or the tibia, fibula, and astragalus displaced forward. No bone or cartilage is removed from the wound. The foot is moulded into the desired position and put up either at a right angle or in moderate equinus. Later, when ankylosis has taken place, and if the bones of the foot are normal, and there is no lateral motion at the ankle joint, lateral motion is prevented. The results of the operation should be a well balanced foot, the foot displaced backwards on the tibia, fibula, and astragalus, obliteration of lateral motion, and a certain amount of definitely limited ankle motion.

In comparing this foot with any form of arthrodesis which includes the ankle joint, the Commission would have no hesitation in giving the preference to the Davis operation, done on a suitable case, because a foot with a limited amount of useful ankle motion is better than a rigid foot, and because in a paralyzed foot, unaided by muscles, the displacement of the foot backwards gives a better bone balance.

Astragalectomy, after the method of Dr. Royal Whitman of New York, consists of the removal of the astragalus through an open incision on the outer side of the foot and the displacement of the foot backwards. A new and simplified ankle joint is made by the tibia and fibula above, the os calcis below, and the scaphoid and cuboid in front. Dorsal flexion of the foot beyond a right angle is absolutely prevented by the scaphoid and cuboid striking against the front of the tibia, and lateral motion is controlled by the malleoli now resting on either side of the os calcis.

Of the two hundred and fifty cases examined by the Commission, not over twenty had relapsed to such an extent that the foot was unserviceable, and these could be easily corrected and made serviceable by a secondary operation. All of the cases of ankylosis, that is, cases in which there was no motion in the ankle joint or between the bones of the tarsus, walked well. Those in which the foot was fixed at a right angle to the leg, or in a moderate equinus, and were able to use the whole foot, walked better than those that were ankylosed in the position of calcaneus, and could only use the heel. But even these heel walkers did well, and despite a limp, got over the ground briskly and

without pain, much better than they could have possibly done with a flail or dangle foot.

Many of the cases that had had transverse horizontal section or astragalectomy were found ankylosed at the ankle joint. As ankylosis of the ankle joint is not a necessary result of either the Davis or Whitman operation, these, though painless, serviceable feet, were counted as failures, and the ankylosis was considered the result of either the selection of unsuitable cases for operation, faulty technique at the time of operation, or lack of proper after-treatment.

In none of these cases of ankylosis of the ankle joint did we find any history of infection. The principal trouble, as far as we could observe, was that the foot was not displaced sufficiently backwards, and was fixed in a position of too great equinus or of calcaneus.

Neither astragalectomy nor transverse horizontal section can be called curative in the sense that the case is definitely cured when the cast is removed and the wound healed. Unequal muscle balance will distort a growing foot and it is not always possible to predict with certainty the actual strength of a partially paralyzed muscle or transplanted tendon. Careless shoeing may also lead to disturbance of balance with consequent deformity.

All of these patients should be kept under occasional observation, if possible, until they have obtained their full growth.

Several patients on whom the operation of transverse horizontal section had been performed, and in whom the foot had been displaced well backward on the leg, were found to be capable of extreme dorsal flexion of the foot. In these the backward dislocation of the foot on the leg seemed to be sufficient, and although all the muscles below the knee were completely paralyzed and there was nothing to hold up the heel, these patients walked as well as the others.

We have used the terms, "Operations properly performed, and selection of suitable cases." For the technique of the operations of astragalectomy and transverse horizontal section, the Commission recommends the recent papers of Drs. Royal Whitman, A. Bruce Gill and DeForest P. Willard. These operations have been perfected by experience, and it is advisable to know just how these operations are being done by their authors at the present time. A still better way is to go to New York or Philadelphia and witness the operation. An astragalectomy or a transverse horizontal section is not a Whitman or a Davis operation unless it is done exactly as Dr. Whitman or Dr. Davis says it should be done.

In regard to the selection of cases, the Commission is convinced that patients having paralytic talipes calcaneus, talipes calcaneocavus and flail or dangle foot, with or without the additional deformities of varus or valgus, are suitable subjects for the operations of astragalectomy and transverse horizontal section, and that patients having active calf muscles are not suitable subjects for these operations. There is also a not uncommon class of cases which resembles equinus or cavus. These, however, have a rigid heel cord and on examination, the astragalus and os calcis are found to be in nearly normal position, and the whole drop confined to the anterior portion of the foot.

The records of the condition of the patients before operation were not always clear on this point, and the Commission arrived at no definite conclusion as to how these patients should best be treated. The Commission found no evidence to prove that either astragalectomy, arthrodesis or transverse horizontal section affected the growth of the foot, but this matter could not be definitely determined.

The Commission finds that the best time for operation is between the tenth and fourteenth year, but the atrophy from disuse is such a serious consideration in the growing child that the surgeon is often forced to operate at a much younger age. If he finds that even after tenotomies, tendon transplants or any of the minor operations have been performed, the patient is still unable to properly use his foot, even with the aid of braces, he is not only justified, but it is his duty to operate at any age.

The opinion of the patient is not a reliable guide in forming a scientific estimate of the value of an operation. With the patient, it is largely a matter of temperament. We saw several patients who were greatly pleased with very ordinary results, and others, one in particular, that were dissatisfied with what we considered very satisfactory results. There are apt to be complications which the patient does not take into consideration, such as partial paralysis of the thigh, hip, or back muscles. Of course, these patients cannot walk as well as those in which only the muscles below the knee are paralyzed.

In contrasting astragalectomy with transverse horizontal section, the Commission believes that astragalectomy done after the method of Dr. Royal Whitman of New York is the operation of choice for the following reasons:

1. It is a clean cut and the operator can see what he is doing. The surrounding tissues are not bruised or mangled, and should the wound become infected, the stitches can be easily removed and the whole cavity exposed and thoroughly drained.

2. Astragalectomy independent of the chances or process of repair definitely and mechanically checks motion in three directions, ad and abduction and dorsal flexion, and lessens the range of plantar flexion.

3. In cases where there is lateral motion at the ankle joint, it is sometimes necessary to supplement a transverse horizontal section with an arthrodesis at the ankle joint, thus losing all motion at the ankle joint. It is urged as an objection to astragalectomy that the removal of the astragalus shortens the length of the leg. This is probably true, but how much is the leg actually shortened? The leg was too short before the operation, and it does not appear to be appreciably shorter after the operation. The shortening can be corrected by placing the foot in the position of moderate equinus and by putting a lift in the sole of the shoe. The reconstructed foot is shapely, well formed, and serviceable. Nobody unfamiliar with the operation of astragalectomy would ever suspect that the astragalus had been removed.

The Commission finds that this objection to astragalectomy is theoretical rather than practical and that it is more than counterbalanced by the advantages of the operation.

PART II.

BY WALTER G. STERN, M.D., CLEVELAND, OHIO.

Since the Association did not define in more specific terms what it meant by a "stabilizing operation," the Commission decided that for the purposes of this investigation, a stabilizing operation was one which limited the untoward motion in one or more of the ankle or tarsal joints in such a way that weight bearing and walking in the physiological position would be restored and deformity, once overcome by corrective operation, would not tend to recur. This would leave out of consideration simple tenotomies and tendon transplantations.

Over seventy-five questionnaires were answered, and practically all in such a clear and concise way that the Commission could not be in doubt as to the experience of the writer. Of these, all except one are agreed that methods designated as 1, 2, 3, (*viz.*, (1) fixation by metal plates, wires, screws and nails; (2) silk ligatures, and (3) bone grafts) are unreliable, objectionable, never indicated and are to be condemned.

Method 7. Living ligaments (after the method of Gallie, Putti,

Peckham and others) is held by the vast majority of writers to be unreliable and unsuccessful.

Only six answering the questionnaire think that living ligaments are good. The Commission was shown a considerable number of cases where the living ligaments either had stretched and pulled out, or where (when they had not done so) they did not grow with the rest of the foot, and, after a few years, a deformity in the reverse direction took place, very much like the untoward results of silk ligaments in a growing foot.

4. Arthrodesis,

5. Astragalectomy, with backward displacement of the foot, and

6. Horizontal Transverse Tarsectomy, are all considered good in their proper spheres, by almost all writers.

This left for the Commission the investigation of the relative merits of the following standard operations:

Arthrodesis,[4] either after the manner of Soule (astragulo-navicular), Ryerson "Triple Arthrodesis" (astragulo-navicular, calcaneo-cuboid, calcaneo-astragular), and the sub-astragular arthrodesis of Davis.

Astragalectomy,[5] with backward displacement of the foot, after the method of Dr. Royal Whitman, and

Horizontal Transverse Tarsectomy,[6] with backward displacement of the foot, after the method of Dr. G. G. Davis, which in the remainder of the report will be called tarsectomy. (Davis.)

For lateral instability combined with good calf muscle and with the foot more or less in equinus, there is a common consensus of opinion of all the operators whose work we have seen, that some form of arthrodesis is the operation of choice. Ryerson prefers the "triple arthrodesis," while Boston, New York and Philadelphia operators seem to favor the sub-astragalar arthrodesis of Davis. The Commission is unable to award either method of arthrodesis the palm of superiority. We did not see many results from the single arthrodesis as proposed by Dr. Soule, but it is favorably commented upon in several of the questionnaires.

The operation of arthrodesis for lateral instability with good calf muscles can be combined with fasciotomy of the plantar fascia, corrective wedge resections (especially to combat the dropping of the anterior part of the foot) and appropriate tendon transplantations, the loop operation of Whitman and the transplant of the peronei for valgus being some of the favorite operations. All operators interviewed were agreed that tenotomy of the tendo Achilles should practically

never be performed in this type of case. Astragalectomy is *not* indicated in equinus.

For the completely flail and dangle feet or for lateral instability combined with calcaneus, the vast majority preferred the Whitman astragalectomy. When done according to the Whitman method, astragalectomy, with backward displacement of the foot, should give exceedingly good results. The foot must be displaced well backwards, the calcaneus entirely overcorrected so that the patients are no longer heel walkers, and there should be some elasticity of motion between the tibia and the foot. Ankylosis is not the object of the Whitman operation. Astragalectomy can be combined with various forms of tendon transplantations or tenotomies for the correction or the avoidance of unfavorable position. Ryerson demonstrated that the toe flexors should always be tenotomized when they are as strong as, or stronger than, the muscles pulling in the opposite direction, to prevent future varus. Where there is a large amount of deformity in the forefoot, it is undoubtedly necessary to correct this before doing an astragalectomy. About this point Whitman is silent.

The common consensus of opinion is, that astragalectomy is not indcated in pes equinus or in the ordinary lateral instability, when there are *good* calf muscles left. Astragalectomy checks the untoward movements of the foot, which is that of dorsal flexion at about a right angle, and by displacing the foot backward, it restores the symmetry and power of the foot, and in successful cases, the heel and toe gait. Lateral instability is entirely overcome. Whitman also claims it is a good operation in severely paralyzed cases to permit brace wearing with comfort, and to do away with the pressure sores frequently encountered as the result of a flail ankle moving and chafing against the upright of the brace.

The operation of horizontal transverse tarsectomy with backward displacement of the foot, first advocated by Dr. G. G. Davis of Philadelphia, was devised for the overcoming of the same deformities and disabilities as the astragalectomy of Dr. Whitman, and where the foot has been displaced backward far enough, as in the astragalectomy, it has given almost equally as good results as astragalectomy. The operation is not so clean cut and essentially *surgical* as is the astragalectomy and the posterior displacement of the foot very difficult to obtain. From what was seen of the operation, it is suggested it be modified so that backward displacement be more easily attained. The very fact, however, that we had to compare the Davis operation to the Whitman

in giving it its proper place, convinces us that the horizontal transverse tarsectomy of Davis is not *the* operation of choice, as is the Whitman operation.

SUMMARY.

1. Metal plates, wires, screws, nails, are objectionable and unreliable.
2. Silk ligatures the same.
3. Bone graft the same.
4. Arthrodesis. Excellent results in lateral instability, especially where there are good calf muscles. The best results are to be found after the triple arthrodesis of Ryerson or the sub-astragalar arthrodesis of Davis. Arthrodesis of the ankle joint is rarely indicated.
5. Astragalectomy with backward displacement of the foot, when done after the method of Royal Whitman, first for calcaneus, calcaneo valgus, etc.; second, for dangle feet; third for lateral deformity, gives by far the best results. In some cases the result has been so perfect and the foot so symmetrical that it would have been difficult to tell that the foot had been operated on, had one not been able to see the scar.
6. Horizontal transverse tarsectomy, after the method of G. G. Davis, gives as a whole inferior results to the astragalectomy and is a more difficult, bloody and less surgical procedure.
7. Living ligaments, after the method of Gallie, Putti, Peckham and others, have given isolated successes, but as a general rule, have not been successful and are not held in universal esteem.

A great many of the fixation cases that were examined were done after the ordinary tendon transplantations had failed, and it would seem that the place for tendon transplantations is as an adjuvant to a "stabilizing operation."

DISCUSSION ON THE COMMISSION ON STABILIZING OPERATIONS UPON THE FOOT.

DR. DE FOREST WILLARD, Philadelphia: After such a report as Dr. Cook and Dr. Stern have given, I think it is possible for all of us to thoroughly agree with the main features of the report. It is very difficult to lay down any absolute rules as to the procedures used in the stabilization of paralytic feet. There are so many factors that enter into it in each individual case,—the age of the patient, the amount of paralysis, not only in the leg, but in the upper leg and the opposite leg; the mental ability of the patient, and the care of the parents. All these must call for a great deal of consideration when these operations are contemplated. Unquestionably, the stabilization operations are the final operations for instability of paralytic cases. They must be thorough, and they must be permanent.

I think that I can speak for all the men of the Philadelphia clinics who have come under the influence of Dr. G. G. Davis, and I think thay my re-

marks on operations are not entirely personal, but will be backed up by the men who have been doing the work. We believe with the Committee that the operations on the soft parts are not permanent, but that those on the bony structures are, especially when combined with procedures on the soft parts. For the cases to which Dr. Stern has referred, in which there was lateral instability, but in which the anterior posterior power of the muscles was preserved, we think that Dr. Davis' sub-astragalar arthrodesis is a most justifiable operation. Lateral motion of the foot takes place normally in the sub-astragalar joints. That operation destroys these joints and thus destroys lateral motion. In some cases lateral motion of the ankle may occur. In these, we do not advise the simple sub-astragalar arthrodesis. With the arthrodesis, we still advise the transplantation of such muscles as will increase the antero-posterior motion of the foot.

As to the flail and dangle-foot types, for which Dr. Davis' operation has been compared with the Whitman operation, we feel that the latter is unquestionably a useful and important operation, but we feel, also, that transverse section with backward displacement of the foot can do the work in properly selected cases and when properly done. I feel that the Commission themselves, if they saw the cases in future years, would agree with us.

For the past three years we have felt that in our older operations the foot was not displaced backward thoroughly enough, and we think that in future they are to be displaced backward more thoroughly. We think that as we go along we shall find even better results in these cases than in the others in which the backward displacement was not emphasized as much as it is being done now.

As to the time of operation in these bony operations, the Committee, I believe, say that ten years of age is probably about the best time in the child's life. It seems to me that perhaps an earlier date could be made. I should like to have the Committee's definite opinion on that, if they will give it. We feel, in Philadelphia, that these bony arthrodeses should be done as soon after the seventh year of life as the prognosis is thoroughly established and all the power that can be obtained has been obtained.

THE TEACHING OF ORTHOPÆDIC SURGERY.

BY NATHANIEL ALLISON, M.D., ST. LOUIS.

In the world of today there seems to be an unusual desire to revalue and redefine; the feeling exists that unless we know where we are going, we are likely to arrive nowhere in particular. Our aim must be directed truly toward our objective before our action can be constructive.

The war we have passed through has brought many of our educational defects sharply to our attention. In our primary schools, in our high schools, colleges, and universities, our methods of teaching are

receiving careful and thoughtful study. The teaching of medicine as it is now taught is being carefully scrutinized. The Committee on Education of the American Medical Association has been actively engaged this last year in a survey of the manner in which medical teaching is being carried on.

President Lowell has said: "The real scholar is not a man who devotes his erudition to a small thing, or who achieves eminence in paths that no one cares to tread; not the man who knows all about the antennae of the paleozoic cockroach, or some Greek root; but the man who has the sharpened brain, who has developed that tool so that he can use it for any purpose for which, in life, he may hereafter desire to use that tool."

These words express well the trend of what I have to say on the teaching of orthopædic surgery.

Orthopædic surgery, along with other special departments of medicine and surgery, has been called upon within the past year to lay down certain rules which might act as guides and checks to those who enter the special fields of medical or surgical practice A committee of the American Medical Associaton met in Chicago last winter to discuss the minimum requirements of education and training deemed necessary for those who would call themselves orthopædic surgeons. This committee agreed unanimously upon a set of minimum requirements, especially stressing the significance of the word "minimum," and these have been set down by the American Medical Association as rules to govern the future of orthopædic surgery in so far as it affects those who will call themselves orthopædic surgeons. The minimum requirements to become an orthopædic surgeon are:

1. Standard medical school course, Class A school, four years.
2. Surgical internship at least one year.
3. Graduate course, one year as interne on service devoted entirely to orthopædic surgery.
4. Six months in allied studies, physio-therapy, shop work, and schools for cripples.

We will have then, after a total of six and one-half years of medical school and hospital work, our minimum requirement man, about to take up his life work as an orthopædic surgeon. The committee, however, recommended more work than this, namely, a three-year course leading to a graduate degree, and more desirable still, work as an assistant to a qualified orthopædic surgeon. The committee also recommended that languages other than our own should be a part of this man's accomplishments, and that he should also be versed in an-

atomy, pathology and neurology, beyond the requirements for the degree in the Class A medical school. With the minimum requirements defined and the further suggestions of the committee, it remains for us, as teachers, simply to decide what we shall teach and how we shall teach it.

In other words, from us, as orthopædic surgeons, must come the definition of our field of teaching and training for the future orthopædic surgeon, and in us must be the ability and power, as teachers, to hand on to him our knowledge and skill, and to stimulate him to constant advancement.

Dr. William H. Welch has said the following in discussing the medical curriculum: "The fundamental object of medical education is to make good doctors. Without question, that should be the underlying conception in all schemes of medical education, and unless a given course of study bears on that training, it should have no place in the medical curriculum. If training in physiology, even, cannot be shown to help to make good doctors, it is not defensible. The same can be said of pathology or any other subject in the curriculum. The ultimate aim of medical education is to make good practitioners of medicine." There can be no disagreement with this statement, I am sure, and the "good" doctor must know something of orthopædic surgery. It is obvious that in our medical school curriculum, some period of this time must be spent in the pursuit of this knowledge. The question that confronts us is how long this period must be and what it should embrace. In other words, what must the undergraduate medical student be required to know of orthopædic surgery before he is given his degree as doctor of medicine? In seeking to answer this question, I realize fully that I shall run against tradition and conventional practice.

I believe that so-called orthopædic surgery differs in none of its principles from so-called general surgery. I believe that the part cannot be greater or more important than the whole, and I further believe that surgery is more important than orthopædic surgery. In consequence, I believe that surgery should be taught the undergraduate medical student without any qualifying or hyphenated characteristics.

All too often, in my observation, the medical student gains the impression that because a certain type of lesion or disease is treated in a special clinic, this lesion or disease belongs, by some sort of divine right to a specialist in this or that specialty of medicine; and that he, the student, need concern himself little either about what is the

method of diagnosis or treatment employed, because it is of a character requiring highly specialized knowledge and skill. The student may have formed some special preference himself by the time he reaches his fourth year of medical-school work, and he is led on by the tendencies toward specialized medicine about us everywhere today. Naturally he begins to regard the "*organ* as greater than the *organism*," and to lose sight of the fact that his greatest possible achievement should be a well rounded basic knowledge of all the essentials of medicine entitling him to be a good practitioner of medicine.

The undergraduate student should be instructed in *surgery*, and that part of surgery which falls into the hands of the orthopædic surgeon should be taught by the orthopædic surgeon. The student should be guarded against the specialist point of view. He should be made to feel that the "organism is greater than the organ," and that surgery is surgery, irrespective of how many divisions are made to facilitate the proper handling of the surgical cases.

From another point of view, surgery should be taught the undergraduate as a big field of work requiring many subdivisions for purely practical reasons, but the surgery that concerns the undergraduate student is not surgical craftsmanship, but surgical diagnosis. In simple words, the undergraduate should learn primarily and fundamentally the "why" and "when" of surgical diagnosis rather than of surgical therapy. The portion of surgery known as orthopædic surgery should be placed before him, not as a department of special surgical technique, but as a part requiring skill in surgical diagnosis. As this is true of purely surgical conditions, so is it also true of medical and neurological conditions. The undergraduate student should get his medicine and surgery in the broadest possible way. He should learn to use his five senses in diagnosis and his brain in interpreting laboratory findings; his contact with clinical material should be so arranged that his knowledge of specialized medicine and surgery should come to him as medicine and surgery, not as any particular brand or department of either. To make my position clear, I would suggest that orthopædic surgery be not taught to undergraduate students as orthopædic surgery, but that the orthopædic surgeon teach them certain phases and problems of surgery. It is our custom to teach orthopædic surgery in the third and fourth years, by lectures and demonstrations. In the seventy medical schools of the United States that are reckoned "A class" schools, an investigation of the instruction given in orthopædic surgery will show that an average of about forty hours of time is taken up in various ways with the teach-

ing of orthopædic surgery. Lectures are given, demonstrations are held, and operations are witnessed, also attendance is demanded at out-patient clinics. The medical student is, as a rule, a surfeited listener at the lectures, he is mildly bored with the demonstrations, and at the operations and in the clinics, he is an "onlooker in Vienna." But above all, he gains the feeling that what he sees and hears represents the work of a group of narrow specialists, that he is not concerned with either the methods used to establish diagnosis in these cases nor with the method of treatment, unless he is to become an orthopædic surgeon; then, of course, his interest quickens

It is the custom to encourage certain students who show an interest in the subject, to elect courses in orthopædic surgery in their fourth year. A better plan would be to teach the principles of orthopædic surgery throughout the clinical years so merged into instruction in surgery that all special atmosphere is removed from the presentation. It is not our avowed purpose in any of the A class medical schools to graduate a student skilled or educated as an orthopædic surgeon or as a surgeon. He is graduated as one educated in principles and instructed in the methods of diagnosis. In fact, the science of medicine and surgery should be his by the time of graduation; the art and craft of medicine and surgery must be attained during his interne years and his early years as an assistant.

Simple adjustment in our medical school curriculum would easily accomplish an arrangement wherein all the specialties were contributors to the general educational qualifications of the student, without undue stress being laid on the specialists' point of view.

The next phase of teaching orthopædic surgery deals with the graduate student. Our typical graduate passes on from the medical school to the hospital, where he serves as an intern for one or more years. This service gives him his first real experience. After this experience, the student will desire to enter a special field of practice and may choose orthopædic surgery. What now shall be his course of instruction? The committee above referred to lays down this rule: one year in the orthopædic service in an active clinic, and six months in allied work, such as schools for crippled, work shops, physio-therapy, and what not. This minimum will give us a man well enough versed in the craft of our specialty to start out on his own for a further development. It is a scanty training for applying the label of full ability as a specialist, but it will suffice as a minimum, and not an ideal standard of attainment. An ideal equipment for such a man would be three years of work, with a university degree as its reward

(assuming that clinical graduate degrees should have academic sanction), thus insuring thoroughness and breadth by the demand for a demonstration of research ability. After that, several years as assistant to some of our ablest and best orthopædic surgeons. Sir Robert Jones says: "In my early days, under the guidance of H. O. Thomas, part of my daily routine consisted in manually unravelling advanced club-feet, aided, perhaps, by tenotomy; each case represented several months of hard work, consisting of alternate stretching and fixation. The lesson it taught was invaluable in demonstrating the effects of perseverance and patience."

Most of us can testify to similar valuable training under the guidance of some one skilled in the art and science and craft of our particular branch of surgery. Most of us also can testify to the value of daily association with our teachers. There is something intangible about this contact, there is something that bears fruit throughout one's lifetime. All realize that much that is good in us and our work came from personal contact with such men, men who had the power and ability to stimulate others to investigation.

To encourage and stimulate our future student in orthopædic surgery, a plan might well be made whereby those desiring to qualify as specialists would pass from one surgical center to another and thus receive a broadened vision of the work and a greater knowledge of the craftsmanship necessary to the proper handling of our class of clinical material. This would, perhaps, add another year to the probation period of the budding specialist, but its value is evident, for do we not, ourselves, constantly improve our methods and enrich our knowledge by visiting each other? The training necessary to an oncoming orthopædic surgeon is simply stated. First of all, he must be by training and experience, one qualified to do surgery. After several years of close application to orthopædic surgery as an assistant to some one able in this specialty, he may, if occasion demands, style himself an orthopædic surgeon and thus proclaim himself a practitioner. He will never cease to strive to improve and advance both himself and his type of surgery, if he be the right sort. He must always be a surgeon plus considerable of special qualifications. He must never be a specialist with low-grade ability as a surgeon. Much harsh criticism has come upon us from this, one of our faults in the past. Future developments must correct it.

What is orthopædic surgery? Sir Robert Jones, with his usual clearness, recently has gone thoroughly over this question and given us an answer. He says: "May I therefore venture to suggest the

group of cases which a modern orthopædic surgeon should be prepared to treat? They should consist of

"Fractures-recent, malunited and ununited.

"Congenital and acquired deformities of the extremities.

"Paralyses of the extremities.

"Diseases, derangements, and disabilities of the joints, including the spine, wry-neck, and those conditions included under the general term, 'bone-setting.' To master the intricacies of so large a section of work requires exceptional ability, and the portals of success are not open to any but the very highly trained. Some of the very distinguished general surgeons who helped us at the orthopædic centres during the war have emphasized the fact that many of the operations involved in that work were amongst the most difficult they had ever known. This is sufficiently good reason for raising the standard of education in the case of all who practice the specialty. The war has taught the orthopædic surgeon that he has to be more of a general surgeon; it has taught the general surgeon that he should be more of an orthopædist."

Our own experience in the war demonstrated the truth of the above remarks of Sir Robert Jones. He adds this bit of wisdom later, in the same address: "A great defect in our large general hospitals is the system whereby the surgeon is expected to treat equally well cases in regard to which he is an acknowledged master, and cases which do not interest him in the least. Once a surgeon is convinced by demonstration of his inability to give the best to the patient, he would no longer care to invite comparison."

The answer to the question, "What is orthopædic surgery?" has at least two aspects. The first is the division of clinical material, and the second is the relationship of orthopædic surgery to general surgery, to medicine, and the other specialties. Perhaps a sharp division of clinical material can never be established, perhaps there is no just reason for having it established. Perhaps, in certain things, old custom and long familiarity will settle the proper place in the subdivisions of medicine and surgery for a certain disease or lesion to find its treatment. It is the border-land material that interests us most, and it is here that most can be accomplished by mutual study and cooperation with other departments of medicine and surgery. Consider for a moment the value to us of the association with the skilled neurologist and physician, review the numerous problems that joint effort has helped to solve, glance back at the advances that have been made through studying clinical problems with the urologist, the

laryngologist, and the oral surgeon. Elasticity, interchange of ideas, and mutual, combined effort in study are the cardinal virtues to be striven for in the inter-relationship of the various clinical divisions of medicine as a whole. Our little wars with the so-called general surgeon come from a misunderstanding of terms, and an insistence upon rigid observance of what are regarded as rights and privileges. There is a certain type of so-called general surgeon who desires to operate only. His interest in surgery is largely from the standpoint of operative technic. Such a one will manifest his interest in the operative side of the diseases that affect the bones and joints, but this interest will fail during the long period of treatment necessary in these conditions. He is glad enough after operating, to turn over the case and responsibility to, perhaps, an orthopædic surgeon. Against this attitude in surgery there should be vigorous protest. The rule in surgery should be that unless a surgeon is willing and skilful enough to care for all the phases of diagnosis and treatment that arise in the individual he assumes the responsibility of treating, then he should assume none of the responsibility, but should advise the patient to seek surgical aid from a surgeon who is able to direct the treatment of the condition from start to finish. The material seen in the practice of any orthopædic surgeon will show a certain percentage of individuals afflicted, not by disease or injury alone, but also by improper diagnosis and treatment, and especially improper sequence of treatment. The fact that ultimate function should be the aim of surgical treatment should not be proclaimed a special attribute of orthopædic surgery. This principle should pervade all surgery. Unless a surgeon has this point of view, he becomes simply an "operator." We must teach our students that the operative side of surgery is comparatively small, that it is necessary to be able to operate well in order to deserve the name of surgeon, but that the ability to operate well alone does not qualify a man as a surgeon. I have often wondered whether it would not be better to regard our specialty as an integral part of surgery, perhaps dealing with the diseases and injuries, malformations and defects, muscular, circulatory, and nervous, of the extremities and spinal column; having as its guiding principle the establishment of function. Let us not have a narrow point of view, and let us have no limiting boundaries. "There is no operation which is essentially orthopædic, there is no splint, simple or complex, which bears the peculiar mark of the orthopædic surgeon." The important thing is that we should train ourselves and our students so that our minds and theirs shall be alive to the ultimate restoration of function. It should be

our mission to introduce this point of view into the practice of surgery and medicine in all departments. "What is orthopædic surgery?" It is simply this,—the surgery of the extremities and spinal column, which has the reëstablishment of function as its guiding principle.

Teaching methods must concern us, as we are of necessity the teachers of the future surgeons who will engage in orthopædic surgery.

There are three commonly used methods of teaching—the didactic lecture, the demonstration, and the clinical conference, either in the lecture room, wards, or the out-patient department. The teaching of orthopædic surgery is carried out in our "A class" schools by these methods.

First, the lecture as a means of instruction. Do not most of us remember much tiresome expenditure of effort, both by lecturer and class, in the pursuit of knowledge by this method? Dr. W. T. Councilman makes this agreeable comment on the lecture as a means of teaching. He says: "Unless the student can gain in the lecture mental recreation and stimulation, the lecture had best be left out, were it not for the aspects which are not usually regarded as among its assets. One is the power of inducing gentle, refreshing, noiseless sleep in the audience, and the other is the educational value of the lecture to the lecturer. To one who is a poor sleeper, there comes a great satisfaction to see sleep descend upon an audience. The lecturer experiences an exhilaration of the demonstration of the possession of a power which makes him akin to God, 'who giveth his beloved sleep.'"

The didactic lecture is less used each year in all our methods of education. Perhaps the reaction against it will undergo modification and it will come back, but one feels that it will never again occupy the place it once did in our teaching methods.

Secondly, in the teaching of orthopædic surgery and kindred branches of knowledge, the demonstration will always have a place, but it should be a demonstration of some principle rather than a demonstration of skill on the demonstrator's part. It should have for its object, "the full recognition of the individuality of disease, carrying with it the necessity of detailed investigation of every case." "Diseases with appropriate remedies cannot be tagged and placed in pigeon-holes." We should order our teaching so that the result of it will be to stimulate the student to seek knowledge by scientific methods. The student and teacher should work together in this pursuit. Dr. C. S. Minot expressed his view on this subject as follows: "The very best that can be said of a lecture or a book is that it describes well the knowledge which some one possesses. There is no knowledge

in books. A book or a lecture can assist to acquire knowledge with lessened loss of time. Knowledge lives in the laboratory; when it is dead, we bury it decently in a book. . . . . A lecture is a spoken book." We must teach our specialty in the clinical laboratory. We must teach it as a science and a craft.

We must, however, stimulate the student to look into books and read lectures "on his own." Surely we must know the background of our special field in surgery. Surely we must keep alive an interest in the investigation of others. To accomplish this, we have a very serviceable instrument to our hands in the review clubs and journal clubs, whose activities are controlled by the students themselves. A good example is that excellent publication produced by Robert Osgood and his associates, called "Progress in Orthopædic Surgery."

It would be well to insist that all students who are seeking qualification as orthopædic surgeons should possess a knowledge of the pathology of bone as tissue and as a substance. The work of Ollier should be the common knowledge of all orthopædic surgeons. Such reading will stimulate the investigative imagination of some, and scientific investigation in the special pathology of the bones and joints is needed. Our prospective orthopædic surgeon should be a man well trained in the laboratory methods of surgical pathology; he should know as part of his common stock of knowledge the literature of the pathology of bones and joints. He should be entirely familiar with the microscopic pictures presented by normal and diseased bone, and by bone undergoing repair and regeneration, as well as disintegration.

Thirdly, the clinical conference. As a means of stimulation, both to the teacher and to the student, the properly conducted clinical conference is of great value. The student is put upon his own mettle, he has an opportunity to work up the case assigned to him so that not only the other students, but also the teacher, may learn. His omissions are as instructive as are his observations. This method, to be fully effective, must be carried on with frankness and informality, and the student must be encouraged to set out for criticism his own point of view, and to defend his methods of examination and the deductions made therefrom. Above all else this method tends to develop proper thinking.

We must realize the economic side of a long term of years spent in unremunerative preparation. And we must face the practical questions before us. There are in this country seventy Class A medical schools. If each medical school in Class A started, each year, two men on the road leading to qualification as orthopædic surgeons, the annual output

would be 140 men. This helps to visualize the necessity for training specialists. It suggests that the general surgeons must care for much of the work. It is our duty to turn out of our "Class A" medical schools, and better hospitals, men who can meet the demand made for what is known as orthopædic surgery. We, as orthopædic surgeons, are responsible for this. We must not only educate and train well a few men, but we must educate and train all medical men in the diagnosis and principles of treatment of surgery of the extremities and spinal column. Having as our object the reëstablishment of function to the diseased or injured part, we must first instruct so that the importance of the whole is not lost sight of in the consideration of details. On details, however, we must insist in our later training. For the orthopædic surgeon must be careful, exceedingly painstaking, deft, and skilled in examination and craftsmanship.

"Of all the sciences, the slowest to progress is the science of education." The thing most needed is the realization on the part of the teacher that he himself should be a student. Also that true education has for its aim the development of the student, and the "sharpened brain." In the teaching of orthopædic surgery there would be no hope for the future unless the teachers of this part of surgery felt the urge to sharpen the brains of their students for further progress.

It is in ourselves, in our attitude toward our work, that lies the future of training and teaching better orthopædic surgery and better surgeons to do the work.

DISCUSSION OF DR. ALLISON'S PAPER.

DR. ROBERT W. LOVETT, Boston: *Mr. President:* I will take up only a minute, because I am so thoroughly in accord with what Dr. Allison said and the way he said it that I shall not make any additions or changes. So long as we remember that we are teaching surgery, we are all right. It think that one thing that we can do which should help is to teach our branch better than they teach other branches of surgery, and in a way to make more impression on the student. There is no use in teaching text-book material for the student can read that, and we could save the time. What is the use of going to lectures and exercises when we could stay at home and read what these contain in less time? Our teaching should deal with things outside the books and should be extra-textbook teaching.

If we regard it as a specialty, it has not one disease to deal with or one organ. Every other specialty deals with one system or organ, or one disease; ours deals with every organ and many diseases.

We have to remember, as Dr. Allison says, that we are only a department of general surgery. I should be glad to have orthopædic surgery taught in closer connection with general surgery. That cannot always be arranged, but in this community it could be done.

The name of orthopædic surgery is not descriptive, and probably in time we can get something better. We should remember that we are teaching only a branch of surgery and, if we wish to make our branch more prominent and effective, we should teach it and practice it better than our colleagues in the other branches.

DR. CHARLES F. PAINTER, Boston: I am heartily in favor of everything that Dr. Allison has said. so I only wish to emphasize what I believe to be a paramount issue in all medical school teaching. There is no question but that we are becoming too highly specialized in the schools. Those who have had any experience with the administration of medical schools problems must realize the pressure which is all the time being brought by the special departments for more time for their particular specialty and this time can only be procured at the expense of the two great departments in every medical school, the departments of medicine and surgery. The school must first of all graduate well grounded practitioners and, after that they may devote any remaining time to perfecting such graduates as choose to specialize.

When it comes to this preparation for a specialty, that is a different matter. I believe that this can be solved by the controlling powers in our universities. They must help out the medical schools in limiting specialization and improving the quality of the product. I think this will be most satisfactorily accomplished by giving a degree of an academic character, which shall be equivalent to the Master of Arts degree, to supplement the degree of Doctor of Medicine.

Just what the composition of the course shall be that will lead up to this degree, must have considerable thought put upon it; but I believe that, with the medical school curriculum properly pruned, there will be time provided for better grounding in the fundamentals of medicine and surgery, thus ensuring a better foundation upon which the special courses may be built. I think that two years or two years and a half would probably be enough, after such a preparation, to devote to any specialty. I am quite sure that when the time comes, that something of this sort can be done, the numbers of qualified specialists will be much more adequately proportioned to the needs of the community than at present. We shall not only serve the community better, but turn out men who will serve the interests of the specialty better than we are doing now.

I was particularly glad to hear such an expression as Dr. Allison's this afternoon come from our own Association. I have not heard much said about it outside and I hope that we can be pioneers in convincing medical schools that this is the best way of administering the affairs of the medical school in respect to the teaching of the special branches of medicine and surgery. I know that it would be for the best interests of the medical schools themselves, as well as for the public, if the departments of surgery should be uniformly organized so as to have the Professor of Surgery chief of all the surgical specialties, having the heads of the special departments under him with the title of Assistant Professor in the various sub-departments.

LOW GRADE INFECTIONS OF THE VERTEBRAL BODIES, PROBABLY STAPHYLOCOCCAL.

BY F. C. KIDNER, DETROIT.

THE industrial problem of the painful, lame back is a serious one and seems to become more serious day by day. Men incapacitated because of a painful back, flood our clinics and compensation boards.

Causes of the pain are many and we must admit, often poorly understood. Muscule-insufficienv, ligament strain, bad posture, sacroiliac and lumbosacral sprain, arthritis of one or more joints, compression fractures,, minor displacements, tuberculosis, syphilis, osteomyelitis, and many others are principal or contributing causes. The exact importance of any one or combination of these in the causation of pain, is difficult to determine. We are forced to admit, too, that treatment is tedious and unsatisfactory. Much of it is empirical and based on anything but an accurate physiological or pathological foundation. Much study must still be put on diagnosis, classification, and treatment, if we are to satisfy the demands of the community and confound our friends, the osteopaths, chiropractors and all the other groups of pseudo-scientific healers.

This being the situation as the writer sees it, it becomes worth while to report and discuss any groups of cases which present clear-cut entities and in which a certain form of treatment gives consistently satisfactory results.

The writer therefore presents the following three cases in the belief that they are all examples of a low-grade infection of the vertebral bodies, by pus-forming organisms, and that they have been cured by bone-bridging, in two cases by means of bone-transplants, and in one by nature's own method of new bone-formation.

Case 1. C. E., 33 years old, white, male, engineer and draughtsman. Occupation sedentary, but has always been normally active in sports, etc. Past health always excellent, family history good; never had gonorrhea, syphilis, typhoid or tuberculosis. In November, 1917, without history of injury sufficiently important to be remembered clearly, began to have pain in right lower back, loin and hip. Not incapacitated but very uncomfortable. Thinks he had had a little fever. Treated by osteopath till July, 1918, when he was forced to go to bed because of increase of pain, which he attributes to forcible manipulations. Pain at that time, in back, both hips and down both legs. Relieved but still present in bed. At this time left leg was flexed and weak for several months. In bed three weeks, then at desk job in spite of pain, till October, 1919. Then in bed until Christmas with adhesive strapping. In January, 1919, not better. X-ray taken, was said by an orthopædic surgeon to show displacement of right sacroiliac joint. Went to hospital where he was manipulated under anaesthetic and put into plaster jacket which he wore two months and then had brace. Enough relief of pain to allow him to go back to desk job, which he stuck at irregularly until February, 1920. Always in pain, sometimes so

severe as to lay him up for days or even weeks. In February, 1920, he felt discouraged with his surgeon and went to a competent x-ray man who examined the whole lumbar spine. This plate revealed a peculiar punched-out loss of substance in the lower right surface of the third lumbar vertebra with some thinning of the intervertebral disk, and a peculiar horn-like growth of new bone, originating from the edge of the diseased portion of bone and growing toward the side of the body of the next lower vertebra, in an apparent attempt to form a truss or bone-graft. He was referred to the writer and immediately consented to an operation for transplanting a piece of the tibia into the spines. He had no visible deformity or crushing of the vertebral body as would have been expected in tuberculosis. Operation was done in March, 1920, three spines on either side of the lesion being included in a heavy tibial graft. Convalescence uneventful, except for a low-grade infection which caused the extrusion of small bits of the graft for several months, but which did not interfere with its strength. Kept in bed eight weeks, then gradually up with a spring back-brace. Pain which began to lessen a few days after the operation, had entirely disappeared at the end of three months, when he went back to work. Now a year and four months after the operation, he is absolutely free from pain and eager for more violent physical activity than it seems best to allow him. The bone cavity is apparently filling in and the new bone-overgrowth seems to have completed its bridge. Laboratory examinations in hospital before operation showed nothing abnormal except a slight increase of the polymorpho-nuclear cell percentage. Widal, Wassermann and Von Pirquet negative. Never had pervertebral abscess.

Case 2. E. McC., 32 years old, white, male, seen first in December, 1919. Mechanic, used to heavy lifting. In 1913 while in the army, hurt his back while scrapping with other men. Bothered him several weeks. No history of typhoid or syphilis. Gonorrhea eight years ago which has not troubled him since. Had tonsils removed five years ago because of sore throats. Has always been a happy-go-lucky fellow who took no care of himself. In July, 1918, while sitting reading, developed a pain in his lower back. Next morning unable to get out of bed because his back was stiff. Body was drawn over to the right with drawing up of the left leg. In bed two months. No rise in temperature but rapid pulse. Then got up but had pain in back, both hips and both legs for six or seven months. Did not work. In August, 1919, had abscess opened in back which continued to discharge. In October, 1919, went to Ann Arbor

where he was thoroughly examined and was told he had early tuberculosis of the spine. Wassermann at that time, negative. He was put into a plaster jacket which he removed the next day on getting home. Then went to a science healer without relief. In December, 1919, went to a competent surgeon, in Detroit, who had further x-rays made and told him that he had tuberculosis of the fourth lumbar vertebra. Referred to the writer. Examination showed marked spasm and limitation of motion of the whole lumbar spine. Just to the left of the spinous process of the fourth lumbar vertebra was a sinus resembling the ordinary tubercular one. The x-ray showed an irregular, punched out area of necrosis in the upper left side of the fourth lumbar extending to the cartilage, which was thin. There was less new bone-overgrowth than in Case one. In spite of this new bone, it was believed that this was a tubercular process and that the sinus came from an abscess originating in the vertebral body, although barium injection of the sinus showed no connection. On the assumption that we were dealing with tuberculosis, an attempt was made to side-track the sinus to the outer side of the erector spinae, so that a bone graft could be done safely. The sinus was found to lead to a collection of pus and bone fragments, lying in the neighborhood of the base of the articular process on the left. Even this was thought to come from the lesion in the body. Pathological examination of the material failed to reveal tuberculosis. Unfortunately cultures were lost. After this operation, both sinuses remained open, discharging pus and bits of bone in small quantity. There was a slight temperature and blood counts, before and after operation, showed increased polymorphonuclear cells. The patient was gotten up with a brace and loafed about, suffering some pain. He refused to carry out any treatment for his tubercular lesion and, indeed, acquired an active Neisser infection with epididymitis in the spring of 1920. A series of Wassermann tests at several different hospitals during 1920 were sometimes positive and sometimes negative, and he received some half-hearted anti-syphilitic treatment as he drifted from place to place. After losing sight of him for eight months, the writer recently saw him again, to find, to his amazement, that the man was perfectly well and working. Sinus closed permanently two months ago. He was wearing no support and had no pain. His Wassermann is consistently negative. His spine is rigid in the upper lumbar region and his x-ray shows a complete bridge of bone across the lesion in the second lumbar body to the third lumbar body. This lesion seems to be filling in and there

is a second healing lesion in the spinous process of the fourth lumbar, apparently the source of the old sinus.

CASE 3. S. N., 29 years old, male, white, laborer. While playing ball in May, 1920, fell across a base and hurt his back. Unable to walk for five days. X-ray said to be negative. ncapacitated all summer by back pain and thinks he had some fever. Pain in whole lumbar region and both hips. X-ray in September, 1920, again said to be negative. When first seen by writer in January, 1921, he had all the signs of tuberculosis of the second lumbar, except for the fact that the x-ray again showed the peculiar punched-out lesion of the lower surface of the vertebra, with thinning of the disk and the horn-like overgrowth of new bone approaching the next vertebra, and an increased percentage of polymorphonuclear cells. No history of typhoid, no syphilis or gonorrhea. In February, 1921, he had a bone transplant, as did Case 1. He has had a normal convalescence with gradual disappearance of pain, and is now well enough to be about freely, wearing a light brace. His x-ray shows further new bone formation and an arrest of the process in the vertebra.

In these three cases, typhoid and syphilis can be ruled out by the history. Gonococcus entered into only one, and then after the appearance of the lesion. Tuberculosis is highly improbable, because of the new bone production, the blood count, the tendency of the lesion to be self-limited, the absence of prevertebral abscess, and prompt cure with good degrees of fixation.

The writer believes that the localization of the disease in a small area of bone, the slight tendency to collapse, the new bone formation, the tendency to get well promptly, and the double infection in one case, justify the assumption that these cases are caused by a staphylococcus of low vitality, closely analogous to that in Legg-Perthes disease; that they represent a considerable group of cases; that they should be recognized early and differentiated from tuberculosis; that they should be treated by early operative fixation, as we are treating painful compression fractures.

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AVULSION OR FRACTURE OF THE LESSER TROCHANTER.

BY C. F. EIKENBARY, M.D., F.A.C.S., SPOKANE, WASHINGTON.

FRACTURE of the lesser trochanter, either from muscular action, or from direct violence, is said to be a very rare condition. Keene mentions that such an accident has been reported, and Kelly and Roberts say that a few cases have been reported, usually in connection with intertrochanteric fractures. The writer has had three cases come under his care, all of them due to muscular action, which leads him to think that the accident may not be as rare as is generally thought. In none of the three were there any other fractures, nor was the fracture of the trochanter complete in any one case. From a study of the Roentgen plates, the conclusion is reached that the fracture or avulsion (which seems a better term) may be complete, only a part of the trochanter may be torn off, or the muscular attachment of the ilio-psoas may be torn loose. In any event the symptoms would be the same. Figure 1 shows the slight proliferation near the tip of the lesser trochanter, indicating that only the muscular fibers were torn loose, the resulting proliferation being due to the torn

periosteum. Figure 2 shows a more extensive proliferation, indicating that probably more of the trochanter was torn off, and that there was a greater injury to the periosteum. This picture was taken about two months after the injury, whereas the radiograph for Figure 1

FIG. 1.

was taken within three weeks of the injury, which might account for the difference in the amount of new bone formed. Fig. 3 shows a definite separation of the outer portion of the trochanter.

Symptoms:

Two symptoms have been present in all three cases, namely, a tendency toward flexion, and pain upon pressure over the region of the lesser trochanter. In one case there was some resistance to both internal and external rotation; one case showed a slight resistance to both abduction and adduction; in all three there was resistance

to extreme extension; all walked with a marked limp, and with a decided lordosis.

Treatment:

Two of the cases had been treated by osteopaths before coming under our care, and had been given the usual diagnosis of dislocation of the hip, and the third case had had no treatment for nearly three weeks following the injury. Therefore, in each instance healing was fairly complete before coming under our care, so that the most

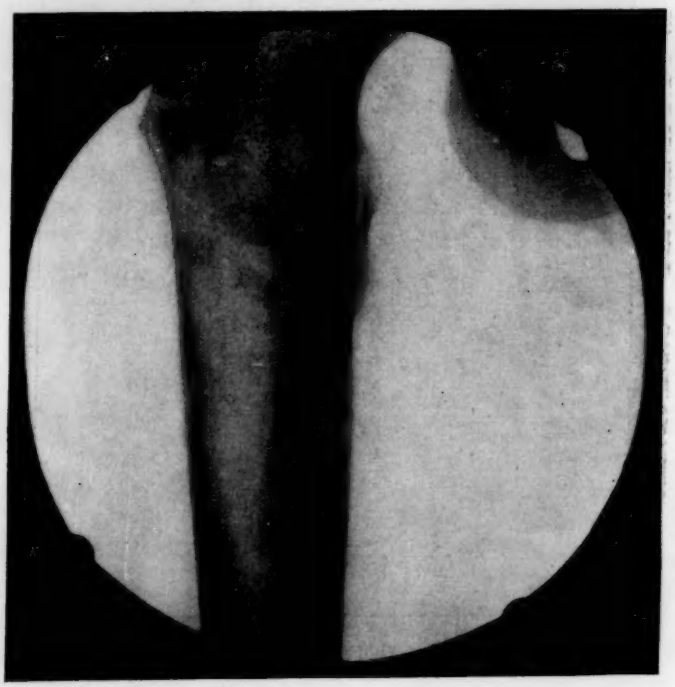

FIG. 2.

expedient thing was to correct the deformity and limp. Accordingly, in each instance, the child was anesthetized, the deformity corrected by placing the limb in full extension, and a plaster cast applied. The cast was worn for six weeks and was followed by complete recovery in each instance. Considering that the ilio-psoas muscle is the offending structure, it would seem that the logical procedure in the recent cases would be to immobilize the hip in flexion. This would probably mean that an anesthetic would later on have to be

administered, and the flexion deformity corrected. The writer doubts whether, from a purely practical standpoint, it makes any difference whether the hip is put up in flexion or extension, except in the cases where the avulsion is complete.

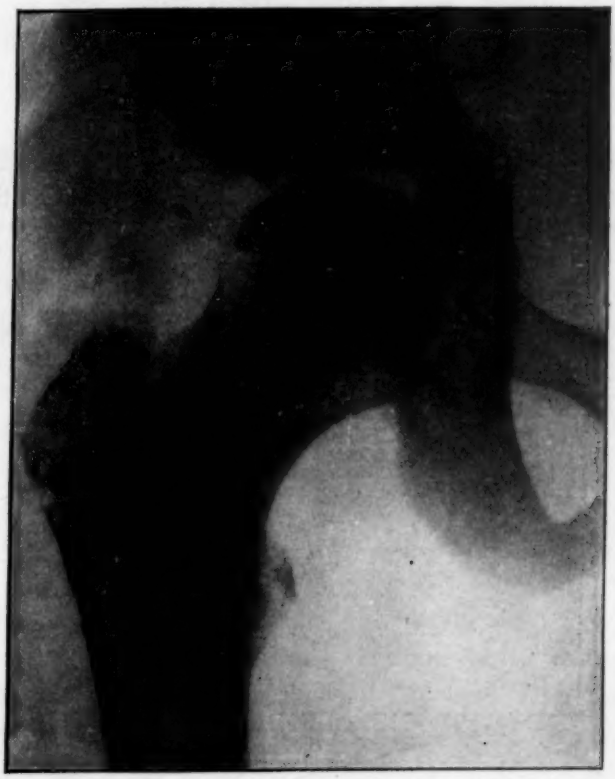

FIG. 3.

Mechanism of the Injury.

The center of ossification of the lesser trochanter begins to develop about the fourteenth year, and shortly afterwards fuses with the shaft. To this region is attached a very powerful muscle, the ilio-psoas, which is chiefly concerned with flexion. Considering the fact that up to the fourteenth year or later, the trochanter is very loosely attached to the shaft, it is easy to see that a powerful exertion of the ilio-psoas could easily tear off either the trochanter as a whole, or any

part of the same. In this respect the condition seems to the writer to be analogous of the so-called Osgood-Schlatter's Disease. The writer's cases were respectively seven, eleven and thirteen years of age. In each instance there had been a severe injury. The oldest case had been in an auto wreck, and had sustained a severe fall. The case aged 12 had been thrown from a wagon, and by a severe exertion saved himself from being run over. The case aged 7 had fallen astride of a cellar door. In each instance the traumatism was certainly sufficient to produce the described lesion.

Since writing before, Dr. McClure of Portland, Oregon, has very kindly loaned me a radiograph of the case of "Avulsion of the Lesser Trochanter," which is included in this report.

DYSOSTOSIS CLEIDO-CRANIALIS.*

BY PROFESSOR MURK JANSEN, LEYDEN, HOLLAND.

THE two symptoms to which dysostosis cleido-cranialis owes its name are the enlargement of the large fontanel and the pseudo-arthrosis or absence of parts (or the whole) of the collarbones. Besides these two symptoms, we have found two others in all cases of dysostosis we have been able to examine, *i.e.*, in seven cases belonging to three families not mutually related:

1. Shortening of the toes. The middle phalanges are too short and

* Read at a meeting of the British Orthopædic Association, June 4th, 1920.

the terminal phalanges lack their widened ends, which look as though they had been nibbled off.

2. Bilateral flattening of the chest.

The flattening of the chest is a mechanical malformation, as are the well-known angular curve in the base of the skull and the displacement of the face, which seems to be pushed onto the base of the skull.

The shortening of the toes is a phenomenon of growth-stunting, as is the enlargement of the large fontanel and the well-known shortening of the extremities.

Both the mechanical malformations and the symptoms of growth-stunting may be explained by assuming that the foetus has been infolded both in its length axis and its transverse axis in the eighth week of foetal life. Direct amnion pressure forces the forehead of the foetus against its chest and the shoulders are pushed forward. The frontal bones, as well as the other bones of the cranial roof, are at that time changing their scleroblastemetous consistency into bone, and thus developing rapidly. Our law of the vulnerability of fast-growing cell groups explains why these very parts are affected by retardation of growth. Enhanced indirect or hydrostatic pressure compresses the middle and terminal phalanges of the toes, which are the only skeletal parts that are still scleroblastematous and at that moment grow rapidly, changing into cartilage.

It is understood that compression of the flexible parts means arrest of blood supply and famine to them. Now, famine to growing parts means death if continued sufficiently long. It means dwarfing of the parts if it is less intense. We thus meet with two principles:

1. Arrest of blood supply may produce dwarf growth (or death).

2. The dwarf growth is proportional to the rapidity of growth. (Law of the vulnerability of fast growing cell groups.)

By applying these principles in the various stages of development of the foetus, we come to the conclusion that smallness of the amnion may produce: anencephaly in the 2nd or 3rd week; cyclopia (from synotia to cebocephaly) in the 3rd or 4th week; achondroplasia in the 5th or 6th week; mongoloid idiocy in the 7th week (v.d. Scheer); dysostosis cleido-cranialis in the 8th week (v.d. Scheer); congenital dislocation of the hip-joint and clubfoot after the 8th week.

FEEBLENESS OF GROWTH.

By comparing the growth of children of the same parents with regard to injurious agents that have affected them, the symptoms of feebleness of growth may be discovered.

They are subject to five fundamental rules:

1. Feebleness of growth may be produced by any nocive agent affecting the child either before or after birth.

2. Feebleness of growth is proportional to the intensity of the nocive agent.

3. Feebleness of growth is proportional to the rapidity of growth both of the parts and of the individual. (Law of the vulnerability of fast growing cell groups.)

4. Feebleness of growth is characterized by enhanced fatigability of the parts.

5. In feebleness of growth the three stages of bone growth (cell division enlargement and differentiation) are affected in inverse order.

By applying these rules in the comparison of children of the same parents, it is found that pedatrophy, athrepsy, "rachitis," exaggerated height of persons outgrowing their strength constitute a descending series of phenomena of feebleness of growth.

NEWS NOTES.

The next meeting of the Central States Orthopædic Club will be held on November eleventh and twelfth, in Kansas City, Mo., and Iowa City, Iowa.

Current Orthopaedic Literature

ANTERIOR TORSION OF UPPER END OF FEMUR IN CONGENITAL DISLOCATION OF THE HIP. ITS CORRECTION. Froelich. *Revue d'Orthopédie*, May, 1921, p. 213.

If a normal human femur is laid on a table posterior face down, the two condyles and the great trochanter will rest on the table, but the neck and head will point upward at an angle of about 15 degrees from the flat surface. In congenital dislocation this anterior torsion of the upper part of the femur may be as much as 90 degrees; that is, the head and neck point straight forward. In such a case, to hold the head in the acetabulum after reduction, it is necessary to rotate the femur until the knee points directly inward. Then when the leg is allowed to go back to normal position the dislocation usually recurs.

This cause of failure is well known and it is generally thought that osteotomy of the femoral shaft is indicated, but this operation can be avoided by a very simple procedure. The dislocation is reduced and the leg placed in extreme internal rotation as usual. Then after a few months, the cast is removed up to a few centimeters above the knee and a supra condylar fracture of the femur is produced without osteotomy. The knee is then rotated to its normal position and held there for a month longer until the fracture is healed.

The femur in children is said to break very easily at this point, especially after being in a cast several months. The extreme anterior rotation which necessitates this procedure is rather rare; only ten out of a thousand cases occurred in the author's clinic.—*William Arthur Clark, Pasadena.*

TUBERCULOSIS OF THE HIP; STATISTICAL STUDY ON 506 CASES TREATED AT THE ISTITUTO RIZZOLI. S. Vacchelli. *Chirurgia degli Organi di Movimento*, April, 1921.

Between 1899 and 1919 there were treated in the Instituto Rizzoli, 2790 cases of tuberculous joint and bone disease, among which were 750 cases of hip disease. This gives tuberculosis of the hip second place, (26.9%), while tuberculous spondylitis holds first place (45.5%) and tuberculous knee disease third (14.4.%). Of these 750 cases, 506 are included in the author's statistics.

Heredity. One hundred and fifty cases, or 29.6%, gave hereditary data in regard to tuberculosis. Trauma was mentioned in 81 cases, or 16%. Of preceding or concomitant tuberculous disease, pleurisy was recorded in 46 cases, scrophulosis in 24, periostitis and ostitis in 23, and spondylitis in 16 cases. Of preceding hip joint lesions of non-tuberculous character, there were four cases of

congenital dislocation of the affected hip and one case of pathological dislocation following osteomyelitis.

Pain. In four-fifths of the cases there was noted a sudden and violent appearance of pain, with attacks of acute pain even in position of rest associated with rapidly developing flexion contracture of the thigh.

Limp. Limping was found to be a constant symptom, which in some cases preceded any other symptom of hip disease.

Rigidity. Rigidity was likewise a constant symptom, associated with pain and observed in various degrees, from simple reflex tension of the muscles to absolute contracture with complete fixation.

Position. Normal position was found in 123 cases. The most common pathological position was that of adduction flexion and inward rotation, (105 cases), next that of abduction flexion and outward rotation (55 cases). In all cases of bilateral hip disease (7), the position was one of flexion, abduction, and outward rotation on one side, and of flexion, abduction, and inward rotation on the other side. It is generally assumed that in hip disease there are two periods in regard to the pathological position; first that of flexion, abduction and outward rotation, and second, flexion, adduction, and inward rotation. While this is true for a majority of cases, there is, however, a not inconsiderable number which differ from this typical course. The single components of position may act independently, as it were, and produce atypical combinations of position. The reason for such deviation from the usual type may be seen in the different localizations of the primary tuberculous focus in the hip: extra-articular, in the head, in the acetabulum, or synovial.

Measurements. In 184 cases, or 36.3%, there was shortening; only in 2 cases a lengthening of the affected side. Twenty-eight cases showed pathological dislocation of the head, among which were several cases of central (intrapelvic) dislocation.

Abscess. Abscesses were found in 205 cases or 40.5% They were distributed as follows: anterior 75 or 14.7%. external 61 or 12%, internal 32 or 6.3%, gluteal 16 or 3.1%, pelvis 5 or 0.9%.

Sinuses. Among the 205 cases with abscesses, 86 had formed sinuses, situated internally, anteriorly, externally, posteriorly, or in the pelvis. Of these 86 sinus cases, 16 followed operative intervention, either resection of the femoral head or removal of the tuberculous focus.

X-ray. Three hundred and seventy-four cases were radiographed. According to the seat of the disease, the author distinguishes the following groups:

1. Diffuse lesions with atrophy, 52 cases. The atrophy involves head and acetabulum No distinct tuberculous foci are seen.

2. Isolated foci, 122 cases.

(a) In the head of the femur, 60 cases. Situated in the upper or lower pole, they may or may not communicate with the joint cavity.

(b) Foci of the neck, in the upper, lower or central part of the latter, 24 cases.

(c) Foci of the acetabulum. From simple erosion to extensive destruction causing enlargement of the socket and upward migration of the head, 30 cases.

(d) Trochanteric foci, 8 cases.

3. Diffuse foci of head and socket, 220 cases. The most frequent type.

(a) With total or partial destruction of the head, 21 cases. In partial destruction there is often left, from the lower half, a bridge of bone, lodged in the acetabulum and preventing the total dislocation of the head.

(b) Dislocation of the epiphysis, 23 cases. These cases are almost always accompanied by grave lesions both of the head and the socket.

(c) Intra-articular pseudarthrosis, 4 cases. In a small number of cases the severe lesion of the head and neck causes the total separation of the head. It is found free in the acetabulum, occupying its normal place. The rest of the epiphysis, and the neck, however, wanders upward.

Treatment. In early cases the routine treatment was traction in recumbency. Immobilization in ambulatory stage was carried out largely by plaster casts. The latter were left for a rather long period (6 to 8 months) between changes. The Thomas splint was applied with preference in children under two years of age. Heliotherapy and artificial quartz light were extensively used.

Results. Data were obtained on 276 cases which had been dismissed from the Institute for 3 to 12 years. Of these, 29 had died. Of the surviving 247, 49 complained of pain, 22 had sinuses, 155 total rigidity, 56 partial rigidity and 196 had a limp.

The end results in the 276 cases were: very good, 31 or 11.2%; good, 173 or 62.6%; moderate, 37 or 13.7%; no results, 6 or 2.1%; died, 37 or 13.7%. —*A. Steindler, Iowa City, Ia.*

TUBERCULOSIS OF THE SPINAL COLUMN. Valtancoli. *Chirurgia degli Organi di Movimento*, April, 1921.

The author's statistics are based upon 1004 cases of tuberculosis of the spine, observed in the Istituto Ortopedico Rizzoli during the period from 1907 to 1919. The disease occupied first place in frequency among the tuberculous affections of the bony system. Among 2790 cases of bone and joint tuberculosis treated in this institute, 1271 cases or 45.5% were tuberculosis of the spine.

Age. In regard to the age, the tables show the highest incidence in the third to fifth year; from the fifth year on there is a noticeable decrease until the beginning of the second decade. The highest figures are reached in this period in the seventeenth to nineteenth year. In the third decade the highest number is reached in the twenty-third and twenty-fourth year. After the twenty-eighth year there is a rapid decrease, especially in the male cases. Beyond the fortieth year the incidence becomes increasingly low.

Heredity. Positive hereditary data were found in 138 cases or 13%. In this the author's figures tally with those of others, but contrast with those of Lorenz (24%) and Gibney (76%).

Trauma. As a factor in the etiology trauma was found in 75 cases or 7.3%. These figures also correspond with those of Delitala who, in 500 cases of Pott's disease observed in the same clinic, found trauma in 5 to 10% of the cases.

Predisposing diseases. Pleurisy. This was found in 214 cases or 21%. Pleurisy

is found very rarely in the first decade and is most frequent in the 3d and 4th, where the incidence reaches 39.6 and 36.3%. It is not uncommonly found in other tuberculous lesions of the bony system, preceding the osseous manifestation, but in no other location does it reach the frequency found in Pott's disease.

Concomitant tuberculous manifestations. Of these, 198 cases or 19.7% were registered, tuberculous adenitis, tuberculous peritonitis, and pulmonary tuberculosis being the most common complications.

Localization of tuberculous spondylitis. In 42% of the cases the disease was situated in the dorsal spine, in 30.1% in the lumbar, in 15.05% in the lumbodorsal, in 6.9% in the cervical, in 3.08% in the cervico-dorsal, in 1.8% in the lumbosacral, and in 1% in the suboccipital region. The first decade shows a decided preference for high localization, while the second shows a numerical predominance for the lumbar section. In the third decade, again, as well as in the fourth, there prevail the dorsal forms. A second vertebral localization of the disease was found only in 19 cases or 1.9%.

Abscess. Lumbosacral Pott's is complicated with abscess most frequently (61%), lumbar Pott's in 40%, lumbodorsal in 32.4%. The greatest incidence of abscess formation is found in the third decade, while this complication is comparatively rare in the first.

In the first decade the forms complicated with abscess are prevalently the lumbar and lumbosacral, rarely the dorsal; in the second, abscesses are found most frequently in the sacral, lumbosacral and lumbar cases; in the third, the greatest percentage of abscesses was found in the cervical cases, as is also the case in the 4th and 5th decade.

Pain. In 760 cases or 75.6% the symptom of pain was recorded. Pain situated in the affected vertebrae is the earliest and most frequent symptom. It is often obscured by radiating neuralgic pain of the lower extremities or by intercostal or abdominal pain of referred nature. Many of the patients had been treated previously for sciatica.

Rigidity. The frequency of rigidity was found equally high, namely in 736 cases or 73.3%. The absence of rigidity and pain in 25% of the cases is explained by the fact that not all patients present themselves during the more acute stages of the disease.

Deformity. Kyphotic gibbus was found in 689 cases or 68.6%. In dorsal disease the prominence is located with the greatest frequency at the 7th dorsal; in cervical disease at the fifth cervical; in dorsolumbar disease the 12th dorsal; in lumbar disease the 2d lumbar.

A scoliotic deformity was found in 188 cases or 18.7%.

Paraplegia. There were 39 cases of paraplegia, equaling 3.9%. Its most common occurrence is in the 5th decade, followed by the second and third. The total number of cases with motor symptoms was 100 or 10%.

The duration of the paraplegia rarely exceeds one year, the condition either clearing up or ending in death. The favorable outcome occurred with prevalence within a period of 6 to 8 months. In cases in which the paralysis lasted more than a year, the mortality reached 50%. Only in 29 cases the final result of the paralysis was established: 56.8% cured, 43.2% died.

Final results. As immediate results are classified those within the first five years from the outset of the disease. Of these, 612 cases are reported: 66.4% satisfactory results, 11.6% deaths. Mortality is highest during the first year of treatment, 55 out of total of 71.

Late results: Good and fair, 159 cases or 79.7%, mortality 30 or 15.1%.

The tuberculous spondylitis takes a noticeably benign course in the first decade, with 73.5% satisfactory results and a mortality of only 6.1%. In the second decade there is a moderate decrease in the number of good results and a considerable increase of the mortality. In the third decade the number of good results decreases to 30%, poor results 17.1%. In the 4th decade the mortality is 8.8%. From the fifth decade on the course of the disease become decidedly unfavorable. Mortality 19.4% in the 5th, 16% in the 6th, 100% (five cases) in the 7th.

Summing up the 30 cases of death among the late results and the 71 cases among the near results, the absolute mortality reached 101 cases or 16.5%; distributed as follows: cases complicated with paraplegia, 43.2%; hereditary cases, 18.3%; cases complicated with abscesses, 17.7%.

The increase in the mortality rate in cases observed for a long period is not surprising, considering the eminently chronic course and the frequent intermissions. Pathological investigations show that in the adult repair of the tuberculous focus does not take place by means of an osseous callus as in children, but rather in form of a pseudarthrosis, which represents an incomplete anatomical repair and should not permit one to place too much confidence in a period of quiescence. Nevertheless, one may say that in the majority of cases the outcome is favorable.—*A. Steindler, Iowa City.*

TUBERCULOSIS OF BONE: RESULTS OF A STUDY. Nathaniel Allison. *Archives of Surgery*, May, 1921.

In this study Allison discusses the variety of lesions observed in bones and neighboring tissues resulting from the different reactions of the tissues to the one infectious agent, tuberculosis. His deductions are based upon 50 cases of bone tuberculosis examined microscopically. The specimens were from the spine, hip, knee, shoulder, ankle and tarsus, wrist, elbow, trochanter major, trochanter minor, tibia, humerus, ulna, sternum, malar bone and rib. No evidence was found of a single instance of primary synovial tuberculosis, the bone being the focus from which it extended in every case. The microscopic anatomy is very thoroughly shown in the 42 figures of the text. True hypertrophy of bone was observed in several instances, which leads Allison to comment, that "When the tubercle bacillus invades tissues which in their reaction to infection readily produce new bone, the lesion observed has as one of its characteristics *new bone* formation" and in contradistinction to this he also states that, "When the tubercle bacillus invades tissues which in their reaction to infection do not readily produce new bone, the lesion observed has *not* as one of its characteristics new bone formation." Further, he states, "In all instances in this study in which tuberculous bone lesions were observed, there was both bone destruction and bone proliferation. When can-

cellous bone was involved, destruction predominated. When compact bone was involved, proliferation predominated."

Allison concludes, and rightly, I think, that the classification of tubercular lesions as observed in different tissues should be much simplified and that all the various processes observed are but the natural and usual reactions of the special tissues involved to infections, some having qualities of quickly reacting to stimulation with proliferation and others showing little or no tendency to thus react and suffering destruction.

These observations quite coincide with those of Stiles and Fraser made several years ago and with the experience of Lovett as shown on the screen at the recent meeting of the American Orthopedic Association at Boston. The microscopic examination of the tissues in Allison's series leaves no room for doubt as to the diagnosis, particularly as in crucial cases measures were taken to prove that the patients were syphilis free.—*Charles A. Parker, Chicago.*

TREATMENT OF LONG STANDING DISLOCATIONS OF THE HIP. J. Schoemaker. *Surg., Gyn., and Obstet.*, May, 1921, p. 461.

Two cases are reported of dorsal hip dislocation of long standing, one of 13 years' duration in a young woman of 23, thought to follow typhoid, and one of 3 months' standing in a man of 61. of traumatic origin. In both cases reduction was effected by manipulation under anaesthetic, using an imitation of Lorenz's method of reducing congenital dislocation of the hip. In the first patient this was preceded by 2 weeks of extension by a 6 kilogram weight, which lowered the trochanter considerably. A plaster spica was used in the frog position, and it was thought that the head gradually forced its way into the depths of the acetabulum. At the time of operation the head was thought to be left "just over the acetabulum" or "resting on the acetabulum." Dr. Schoemaker thinks that when the x-rays show normal bony outlines, even in a dislocation of long standing, an attempt at manipulative reduction should be made rather than open reduction or transposition. The femoral head must be brought to the entrance of the acetabulum with the limb placed in complete abduction after complete flexion. The young woman had two spicas each of 6 weeks, with diminishing abduction, the man had a spica for only 15 days. Both walked without a limp after recovery.—*J. A. Nutter, Montreal.*

HABITUAL OR RECURRENT DISLOCATION OF THE SHOULDER. T. T. Thomas. *Surg., Gyn., and Obstet.*, April, 1921.

Twenty-six new cases are added to eighteen formerly reported. Of the 44 cases operated 42 were anterior and 2 posterior. Both posterior cases were in epileptics and one of these had a redislocation during first convulsion after operation. Of the other 42 cases 18 were epileptics with 6 recurrences and the same number in the 24 non-epileptics. The operation advised and employed in nearly all cases is repair of the torn portion of the capsule. For

anterior dislocations the so-called posterior route is used, the incision and approach being in the axilla behind the axillary vessels and nerves. He considers a bone operation rarely indicated. The anatomical difficulties in getting adequate exposure of the torn part without danger to important structures are emphasized. The "posterior route" lessens these difficulties, but this requires very careful and accurate dissection. His results have improved with experience.—*R. W. Billington, Nashville.*

INFRACTION OF THE SECOND METATARSAL HEAD. C. F. Painter. *Boston Med. and Surg., Jour.*, May 26, 1921.

Three cases of this lesion are reported in detail, all operated upon. One of these was of three or four years' duration when operated and the head of the second metatarsal had separated, forming a sequestrum. The base of the first phalanx was flared and had bone spicules around the margin of its articular cartilage. The operative findings suggest an impaction of the metatarsal head against the phalangeal cartilage. The other two cases were more recent and showed separation of the articular cartilage of the metatarsal. The condition seems to be the result of trauma such as stubbing the toe. Only a few such cases are recorded in the literature, but the author thinks they are probably not extremely rare.—*R. W. Billington, Nashville.*

A NEW METHOD OF TREATING RECENT FRACTURE OF THE OS CALCIS. David C. Strauss. *Journal A. M. A.*, July 16, 1921, p. 176.

The mechanism of the production of fracture of the os calcis is explained. The patient is anaesthetized on a Hawley table. A subcutaneous tenotomy of the tendo Achillis is performed. The latest model Steinmann pin is inserted from the mesial to the lateral surface of the heel above the body of the os calcis immediately anterior to the tendo Achillis. The protruding ends of the pin are protected by sterile gauze. Downward traction is made by an assistant forcing the posterior fragment in apposition to the anterior fragment. The anterior fragment is forced up by pressure in the arch with an orthopædic block. Downward traction and upward pressure are made by assistants while the operator applies a plaster cast. This constitutes the chief advantage in the method, since the foot is held in proper position during the application and setting of the cast.—*E. Z. Holt, Atlantic City.*

SPINAL CURVES IN GROWING CHILDREN. E. H. Bradford. *Boston Med. and Surg. Jour.*, May 19, 1921.

Spinal curvatures, in most instances, are not to be regarded as a definite disease but as a fault in growth. Treatment is not simply correction of the curves so much as the guidance of growth to a normal standard of carriage

of trunk shape. The principles of treatment are that easily tired backs should be properly rested, weak-muscled backs should be strengthened, and stiffened parts of the column should be made flexible as possible. Many practical suggestions are given as to management of faulty postures in children and mild types of structural scoliosis. Simple types of braces for both antero-posterior and lateral curves are shown. For practical purposes he divides the cases into three groups: Habit curves in healthy backs; weak backs with weak muscles or back tissues; and twisted backs with varying resistance to correcting pressure. Conclusions based on the author's large experience are: Flexible curves without structural changes in healthy patients can be restored to normal under proper guidance; this result can also be expected where some abnormal stiffness is present, though special measures may be required; fixed rotary cases need thorough measures if improvement is to be expected even in young children; it is not difficult to prevent increase of curves in healthy adolescents if carefully treated for a long period.—*R. W. Billington, Nashville.*

BACKACHE. S. Epstein. *Medical Record*, April 30, 1921.

The author mentions several of the causes of low back pain and rightly protest against the now popular habit of calling all of these cases "sacroiliac strain." He emphasizes the value of x-rays in making the diagnosis and of plaster jackets and spicas in the treatment. The article is a brief one and most of the remarks rather general.—*R. W. Billington, Nashville.*

SCOLIOSIS. S. Kleinberg. *Surg., Gyn., and Obstet.*, April, 1921.

The author has not used the Abbott method during the last four years, having found it impracticable and disappointing as to results. He now uses plaster jackets applied with the patient suspended by a Sayre halter and lateral pressure by straps over the convexities while pelvis and shoulders are fixed. Windows permit expansion of depressed areas. Jackets are repeated every month or two, getting a gradual improvement of posture and usually more or less correction of spinal curves and chest deformity. He considers structural scoliosis incurable as regards complete correction. Details of technic are described, but nothing new. He emphasizes necessity for preventive and early treatment. This extension treatment must be continued uninterruptedly for many years, changing the jackets while patient is suspended so as to avoid even momentary relapse to the previous faulty posture.—*R. W. Billington, Nashville.*

PRINCIPLES OF POSTURE, WITH SPECIAL REFERENCE TO THE MECHANICS OF THE HIP-JOINT. Mabel Elsworth Todd, M. D. *Boston Med. and Surg. Jour.*, June 23, 1921.

Dr. Todd gives a brief and comprehensive description of the intra-pelvic and the extra-pelvic groups of muscles which control the hip-joint, pelvis, and lumbar spine. Her theory is that these structures maintain the obliquity of the pelvis, the correct lumbar curve, and, in this way, the normal posture of the superincumbent thorax and skull. The head of the femur and acetabulum are likened to the hub of a wire bicycle wheel and the groups of muscles referred to above to its spokes. All these factors serve as shock absorbers and counter-balances for the different motions of the lower limbs in their support of the trunk and their maintenance of equilibrium. Dr. Todd asserts that the muscles and joints should be entirely free in their action, if the maximum of relief from stress and strain and a perfect equilibrium are to be maintained. The article is illustrated by eight excellent plates, and is a very thoughtful and logical exposition of the matter of posture in and about the pelvic girdle.—*H. A. Pingree, Portland, Me.*

THE CURE IN INFANTILE RICKETS BY SUNLIGHT: PRELIMINARY NOTE. Alfred F. Hess and Lester J. Unger. *Journal A. M. A.*, July 2, 1921, p. 39.

A preliminary note based upon the results obtained in the treatment by sunlight of five infants between six and twelve months and two between twelve and eighteen months. The legs, arms, trunk and face were exposed in turn from one-half to several hours. Every case improved. In one instance the improvement was noted thirteen days after heliotherapy was instituted. The writers recognize diet as an important factor in the etiology of rickets. They believe sun-light is also of importance.—*E. Z. Holt, Atlantic City.*

TWO CASES OF GENERALIZED LATE RACHITIS. Rendu and Werteimer. *Revue d'Orthopédie*, May, 1921, p. 215.

The authors report two cases of rachitis in girls of eleven and thirteen. Case 1 was apparently a normal child up to about twelve years, when enlargements were first noticed at the wrists and ankles. A bilateral genu valgum and a thickening of the upper end of the tibiae also developed. She had considerable pain in walking, but not much when at rest. The thickening at the wrists and ankles was quite marked and typical of rachitis but the spine and thorax showed nothing abnormal. Case 2 had similar swellings at the wrists, ankles, and upper end of the tibiae, also genu valgum. Nothing was known of the history from birth up to eight years, but the deformities did not appear until the child was about ten years old.

Roentgen rays of these cases showed stratified transverse areas of decalcification in the bones near the epiphyseal lines. The shafts were normal. Late rachitis was first described by Ollier at Lyon in 1861. Before that time the condition had been regarded as osteomalacia. Such cases are exceptional, only five being reported by Deydier in 1895. The term should be confined strictly to cases which were absolutely free from rachitis in infancy.

The etiology seems to be obscure. Among the suggestions as to the cause are: albuminuria, changes in connection with puberty, endocrine disturbance, infection.—*William Arthur Clark, Pasadena.*

DEVELOPMENT OF CYSTS IN CONNECTION WITH EXTERNAL SEMILUNAR CARTILAGE OF THE KNEE JOINT. R. Ollerenshaw. *British Jour. of Surgery*, April, 1921.

The author has encountered cystic change in the external semilunar cartilage of the knee in three instances. Twelve similar cases are reported in the literature, all, curiously enough, involving the external cartilages. The histories are quite similar; first a slight injury followed by the development of a swelling over the external cartilage, then gradually increasing pain, and lameness. The swelling occurs at the junction of the anterior and middle third of the cartilage. It is fluctuant, but rather tense.

The author's first case had been operated on 18 months previously, with simple excision of the cyst. The growth promptly recurred. This is characteristic of other reported cases, recurrence promptly following simple excision. In one such case the cyst was excised three times before complete removal of the cartilage was resorted to. The author's three cases were operated on by total excision of the external cartilage with the cysts intact. Each case had a normal convalescence, with recovery of full function and no pain on motion.

Hemorrhagic or myxomatous degeneration of the cartilage was presumed to explain the formation of the cysts. On examination, the cysts were multilocular, lying in the outer border of the fibro cartilage. The lining was smooth and the contents a clear, mucoid material. Microscopically, the cysts were lined with flattened endothelium similar to that of the synovia. This seemed to preclude degeneration as the chief factor in the etiology. The author believes the cysts developmental in origin due to small endothelial inclusions in the cartilage during the formation of the joint. Trauma may act as the exciting agent to further development and growth of the cyst. Other observers have not noted the presence of endothelial lining in the cysts, regarding them as degenerative in origin. Some classify them as ganglia. All, however, agree upon their tendency to recur after simple excision. No explanation is offered to their predilection for the external cartilage.—*J. W. Snyder, Rochester, Minnesota.*

CEREBRAL SYPHILIS OR CERVICAL RIBS. Dept. of "Instructive Mistakes," *British Jour., Surg.*, April, 1921, p. 529.

A woman aged 46 was admitted with the diagnosis of "cervical ribs" because of weakness and wasting of the ulnar group of muscles of the right hand. The x-ray showed a cervical rib on each side. The diagnosis was only doubted after note was made of transient unilateral facial paralysis. This suggested cerebral syphilis, which was confirmed by cerebrospinal fluid examination and the Wassermann test.—*J. W. Snyder, Rochester, Minnesota.*

TRAUMATIC SPONDYLOLISTHESIS; REPORT OF TWO CASES. S. Kleinberg. *Archives of Surgery*, July, 1921.

Kleinberg reports two cases of this rare condition coming under his observation in which the dislocation forward of the fifth lumbar vertebra was disclosed by the x-ray. One was in a laborer 55 years old who had been struck in the back by a beam and knocked down and was confined to his bed for eight weeks, after which he gradually resumed walking, but with much painful effort. An examination at this time showed a marked hollow of the back just above the top of the sacrum and pressure here caused severe pain and disability. The x-ray showed the fifth lumbar vertebra displaced forward with the anterior part of the body depressed in front of the sacrum, establishing the diagnosis of spondylolisthesis.

The other case was that of a man 35 years of age who some months previous to the examination was carrying a heavy weight on his back, when suddenly another weight was added, causing it to "cave in," as he expressed it. He felt severe pain in the lower part of his back but continued his work and kept on working for several months longer, when increasing pain and disability finally made him give up all work. The distinct hollow above the top of the sacrum suggested the diagnosis of spondylolisthesis, which was confirmed by x-ray. In this latter case the ability to carry on his work to some extent would seem to discredit the diagnosis of so formidable a condition, but Kleinberg mentions five cases he had seen with Dr. Darling in which the disability was of a similar benign type. He believes that the x-ray appearance is pathognomonic, the stereoscopic views rendering the exact pathology quite clear.—*Charles A. Parker, Chicago.*

A CONSIDERATION OF THE ETIOLOGIC FACTORS IN MYOSITIS OSSIFICANS TRAUMATICA. Charles F. Painter, M.D. *The Boston Medical and Surgical Journal*, July 14, 1921.

Dr. Painter reports one case of ossification in muscular tissue which he has seen recently. The condition appeared some weeks after an injury to the muscle and was complicated by a synovitis of a nearby joint. Removal of the osseous material, followed by baking and massage, produced marked improvement.

Many writers upon the subject are quoted, but after a perusal of their theories as to causation, none seems to fit all cases, and one is forced to the conclusion that the condition is not yet well understood. Dr. Painter suggests that a certain diathesis or dyscrasia exists which, when subjected to repeated trauma or violence, produces myositis ossificans.—*H. A. Pingree, Portland, Me.*

Concerning the Pathology of Curvature of the Radius. Pilatte. *Revue d'Orthopédie*, May, 1921, p. 223.

In these cases of bowing of the lower end of the radius the roentgenogram shows the radial styloid below the ulnar styloid. The idea that the deformity is due to shortening of the bone does not hold. Masmonteil, who seems to be sponsor for the shortening idea, says he has seen a condition exactly like the Madelung deformity which followed fracture and subsequent shortening of the radius. However, the hand is deviated toward the radius in case of such a fracture while the deviation is almost always toward the ulna in the Madelung wrist.

The fact that the lesion is bilateral in about two-thirds of the cases is further evidence against the theory of shortening.

Tillier, in studying the development and strucutre of the radius, has demonstrated a weak point in the bone just above the epiphyseal line. It is possible that this point of least resistance is the cause of the curvature. The fact that the curve is backward is explained by the predominance of the flexor muscles. —*William Arthur Clark, Pasadena.*

Surgery of Peripheral Nerve Injuries of Warfare. H. Platt. *British Medical Journal*, April 23, 1921.

This admirable paper should be studied carefully in the original text, and serves almost as a standard in the modern treatment of peripheral nerve injuries. It is based on a personal series of 510 operations and affords a wealth of general as well as specific information on this subject.

The frequency with which the ulnar nerve called for treatment, the infrequency of operations on the brachial plexus, the complete absence of any operation on either the musculo-cutaneous, circumflex or anterior crural nerves are especially noteworthy. Two hundred and forty-eight early and late results are investigated. These operations included 150 cases of end-to-end suture, 80 of neurolysis, and 18 of bridge operations. The end-to-end sutures gave 118 or 79% of recoveries.

While improvement has occurred in the neurological syndrome after the operation of neurolysis in 75% of cases, it has been impossible to prove that the operation itself alone has determined this. Therefore, the limitations of the operation of neurolysis as a definitive factor in the surgical treatment of the warfare lesions of nerves are to be fully realized.

From a series of 25 operations performed for severe causalgic manifestations,

the author concludes that the efficacy of the operation of early resection and suture for severe causalgia is beyond criticism, and is certainly a more exact procedure than the equally, or even more destructive method of alcohol injection.

The Hunterian Lecture, of which this paper is a part, invites careful perusal as the work of an authority, and is the best article so far on this subject.—*Ellis Jones, Los Angeles.*

AUTOGENOUS BONE TRANSPLANTATION. Melvin S. Henderson. *Journal A. M. A.*, July 16, 1921, p. 165.

The paper is based upon the experience and results obtained at the Mayo Clinic. Bone transplantation has been performed on four hundred and thirteen patients during eight years. One hundred and sixty-six of the number were operated upon for tuberculosis of the spine. Nearly the entire remainder were operated upon for ununited fractures. Of the traceable cases operated on for tuberculosis of the spine, fifty per cent. were regarded as cured or as having the disease arrested. Twenty-nine per cent. were improved, twenty-two per cent. were unimproved, nine per cent. died later, and two and twenty-six hundredths per cent. was an operative mortality. Of the traceable cases operated on for ununited fractures, seventy-nine and three-tenths per cent. were successful, eighteen and eight-tenths per cent. were failures and one and seven-tenths per cent. of the patients died. The author is certain that his results have been improved by using the massive graft and clamping in to the fragments by aid of beef-bone screws.—*E. Z. Holt, Atlantic City.*

OBSERVATIONS ON THE NORMALLY DEVELOPING ELBOW. Isidore Cohn. *Archives of Surgery*, May, 1921.

Whoever has had to deal with the x-ray of the injured elbow of a child six years old will appreciate the value of this series of roentgenograms presented by Cohn, covering the various phases of the x-ray appearance of this multi-epiphyseal articulation from the age of 17 months to the seventeenth year. With a series of 24 joints, he represents practically all the stages of development with anteroposterior and lateral views.

A detailed knowledge of the x-ray appearance and time of appearance of all the main centers of ossification should be a part of every surgeon's primer.—*Charles A. Parker, Chicago.*

FOR BETTER TREATMENT FOR CRIPPLED CHILDREN. H. L. Langnecker. *California State Journal of Medicine*, April, 1921.

The writer makes an appeal for special legislation to provide for the education of crippled children whose physical disability prevents attendance at the regular public schools. The adoption and favorable working of the Educational Amendment would solve this problem in California, and the support of the profession is asked to obtain enactment.—*Ellis Jones, Los Angeles.*

THE STANDARDIZATION OF METHODS OF TREATMENT IN ORTHOPÆDIC SURGERY AND INDUSTRIAL SURGERY OF THE EXTREMITIES AND SPINAL COLUMN. R. B. Osgood, *Illinois Medical Journal*, April, 1921, pp 342 to 352.

This is a brave attempt in one journal article to cover a very large field of surgery.

There are at least 30 headings and subheadings discussed in the eleven pages, starting with "Tuberculosis of Bones and Joints," and finishing with a general statement on the care of compound fractures. The author was impelled to undertake so arduous a task by the great differences he had observed in the methods of treatment and the time required for common conditions under the care of equally qualified surgeons. He combines orthopædic with industrial surgery, as they are both extensively concerned with the surgery of the extremities. The surgery of the spine must also frequently be considered in industrial surgery as well as in orthopædic surgery. Taking up the topics *seriatim*, he first considers tuberculosis of the bones and joints, emphasizing the difference in care in children and adults—in the former following the dictum of Kirmisson: "Jamais résection, jamais résection," but in the latter following the dictum of too many others: "Once we have made a positive diagnosis of tumor albus in an adult whose full growth has occurred, our next step is to set the day for excision, and, unless the joint is very acute as a result of trauma or too great use, the earlier we set the day, the more perfect weight-bearing and useful limb shall we secure."

In further discussion of tuberculosis of the adult knee in which excision is the rule, he says: "We have never known an adult tuberculous knee premanently to recover useful function without excision or erasion." The author, of course, means a useful limb rather than the knee-joint, as resection or erasion should ankylose the joint. With this understanding as to useful function, the author has been unfortunate in his treatment and observation not to have seen many adult knees that have healed and the limb become useful under careful and consistent fixation methods without operation. It is quite probable that the adult tuberculous knees that are in the stage giving the best results from excision will also give equally good results from proper nonoperative treatment, the same as in children, and the patient working while wearing the apparatus; while the disorganized and secondarily infected knees of adults will not give good results by either method, amputation being the measure of choice.

Spine. "We consider the routine employment of homogenous bone grafts or extensive ankylosing operations on the spine in tuberculous disease in young children is still *sub judice.*" In adults, he condemns bone grafting operation with faint praise.

Rickets. Speaking of bow-legs and knock-knees: "There may be methods of choice in individual cases, but the large series of successful end-results of the osteoclases of Blanchard and the epiphyseal slidings of Codivilla should make us slow to condemn these rather rough—one may say almost brutal—but quite safe methods."

Adolescent Rickets—coxa vara. Favors abduction under full anesthesia, and cast.

Scoliosis. No standard method; very dubious outlook. However, there should be a note of optimism, as many of the future cases of scoliosis are now being prevented by early care of the trunk in infantile paralytics.

Congenital Deformities. Favors bloodless methods in congenital hips, but is open to conviction if other surgeons can duplicate Galloway's recently reported large percentage of cures by operative methods.

Believes *clubfoot* treatment should begin the day it is discovered, by manipulations, adhesive plaster and casts, and later by Ober's operation, when previous measures have not been used or are unsuccessful.

Poliomyelitis. Early protection against deformity is urged and later tenotomies and transplantation of tendons advised when necessary.

"The intra-sheath method of Biesalski and Mayer represents theoretically the most perfect technique. but we are not yet convinced of its habitual necessity in the light of end-results." He also advocates unremitting training of the remaining musculature as the last step in connection with what stabilizing operations are needed.

Foot strain and Faulty Weight-Bearing. "Restoration of normal balance is the standard treatment." This he amplifies to include exercises, apparatus and special shoes.

Osteomyelitis. "We believe that Dakin's solution and Carrel's meticulous technique have shown better results than any others, and what is significant, these results have been repeated by other surgeons who have omitted no essentials of the methods."

Joint Infections. He refers particularly to the acute types and believes most infections, unless there is frank pus in the cavity, will be overcome by lavage of the joint for ten minutes with a saline or mild aseptic fluid. Following this, the synovia should be closed and will rarely need to be reopened. He also quotes Willems' experience with small incisions and voluntary movements of the joints—principally the knee—as being successful in properly selected cases, but he does not favor resecting septic joints. After clean operations on the knee he advocates early resumption of voluntary movement.

Amputations. He favors a properly performed Syme's amputation and the early use of a weight bearing plaster pylon in leg and thigh amputations to inure the end of stump to pressure. Strapping has proved valuable in the treatment of sprains. Complete reduction and incomplete fixation are advocated for dislocations.

Fractures—Spine. Advises operation when pressure symptoms do not suggest severance of the cord. and rest and recumbency for those not producing cord injuries. He suggests the possibility of ankylosing operations as the method of choice in the future. Fractures of the transverse and spinous processes are not to be considered so important.

Clavicle. Lying on the back with a pillow between the shoulders is suggested as the best method, although a posterior cross of wood or plaster is good for ambulatory treatment.

Shoulder-joint. Replacement of dislocated head and abduction for these and fractures of the surgical neck.

Shaft of Humerus. Jones' humerus traction splint.

Elbow-joint. Acute flexion except in olecranon fracture.

Both Bones of the Forearm. A plaster cast extending above the elbow and below the wrist with the forearm extended and almost fully supinated.

Colles' Fracture. Break up impaction, correct rotation, put up in plaster with palmar flexion and ulnar deviation.

Carpal Fractures. Excision is given as the method of choice when reduction is not possible.

Pelvis. Recumbency, belts, or plaster spica.

Hip-joint. He discusses intracapsular fractures and strongly recommends the abduction and inward rotation methods, employing plaster, traction, Thomas's splint, Jones's abduction or Balkan frame. He also reports the good results of the Maxwell-Ruth method.

Fracture of the Upper Two-Thirds of the Femoral Shaft. The Thomas leg splint is given as the standard treatment.

Fracture of the Lower Third of the Femoral Shaft. He prefers the ice tongs in the condyles with traction.

Knee-joint Fractures. Reduction and early resumption of voluntary movement.

Fractures of the Patella. Operative treatment is the method of choice.

Both Bones of the Leg. Advocates the Parham band in oblique fractures. Tenotomy of tendo Achillis in fractures of the lower part, if necessary to secure position.

Fractures of the Ankle. Correction of deformity and plaster of Paris.

Fractures of the Astragalus and Os Calcis. Correct deformity by molding or otherwise. Astragalectomy occasionally justifiable.

Compound fractures. Advocates thorough chemical and mechanical cleaning of wound and early closure. In closing, he makes a plea for the possession of seven standardized traction splints by all industrial plants, as traction is the most important factor in the treatment of fractures of the long bones and joints.—*Charles A. Parker, Chicago.*

AN ADJUSTABLE EXTENSION AND SUSPENSION "BALKAN" FRAME. Nathaniel Allison. *Surgery, Gynecology and Obstetrics*, May, 1921, p. 459.

Dr. Allison here describes and pictures a Balkan frame made of one and one-sixteenth inch iron tubing, capable of being adjusted to any hospital bed of standard dimensions. Its description is given in order to emphasize the value of suspension treatment of fractures and joint injuries in our civil hospitals, and to interest others in having available in our hospitals, for immediate use, a frame made of tubing, which will not present the disorderly appearance of the wooden Balkan frame. The device is not claimed to be new in any of its principles.—*J. A. Nutter, Montreal.*